# THE IRON TRADE REVIEW

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## THE WEEK IN IRON CIRCLES.

### THE MARKET AT LARGE.

The elements of strength in the iron trade, which have been commented on from week to week, persist. This banner year in iron and steel production bids fair from all indications today to be succeeded by even a greater one, notwithstanding that this year closes on the highest prices of the twelvemonth. The advances of the past month have been in the face of a strong and widespread conviction that there were possibilities of harm in the situation. But conservatism has ruled up to this time and there are powerful influences at work to prevent anything bordering on a runaway market. Pig iron has been the conspicuous factor for some weeks and still leads in interest. Since the advances of the past week, amounting to about $1 a ton on most foundry grades, there has been a quieter market, due in large part to the fact that most buyers have made contracts covering their wants for the early months of 1902, and many for the first half, while a few important concerns, that have sold their own product far ahead, have bought for the entire year. It is practically impossible now to get December iron, and what can be had goes at a considerable premium. In the Pittsburg market all descriptions of iron have brought higher prices in the past week, No. 2 foundry as high as $16, gray forge as high as $15 and Bessemer in small lots as high as $16.65. It is probable that the United States Steel Corporation will shortly make a considerable purchase of Bessemer iron for the first quarter of 1902 and that the price will be $15.25 at Valley furnace, the basis that has been maintained for months. The bearing of market developments in the next two or three months on the price of Lake Superior ore for next year is important. No advance on the base price for old-range Bessemer ores is now expected, though some Mesabi Bessemers that were sold low this year will be advanced, and there may be a slightly higher price for the best non-Bessemer ores. The steel market presents no new developments, but the source of their steel supply is a question of increasing concern to independent sheet, bar and rod mills. Some weeks ago sales of billets and sheet bars for delivery in the first half of 1902 were made at prices about $3 below those now current; but steel makers are now unwilling to quote for next year. The demand for structural steel keeps up in a remarkable way, and 1901 and 1902 are both expected to be record years. In the past week additional ship plate orders have been placed. The large lake shipbuilding interest now has 34 vessels booked for delivery next year. The railroad contribution to next year's prosperity grows with each week. It is now the expectation that the rail mill of the National Steel Co. will be started up shortly and that it will run for the greater part of next year. The coke situation has improved somewhat so far as Pittsburg and the Valleys are concerned, but an increasing number of foundry suspensions have resulted from the short car supply, this being pronounced in the Chicago district.

### PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Dec. 4.

The switchmen's strike, started last week, continues to prevent the proper delivery of iron, coal and coke to the plants in this district and as a result a number of plants have been compelled to shut down from three to four days at a time, owing to the lack of proper supplies. Not only the small but the large interests are affected and the production of both iron and steel products in the past ten days has been greatly curtailed. The strike, however, did not reach the proportions predicted by the switchmen and there is every indication of an early settlement.

Stocks of finished material are also accumulating in the yards of the steel companies at a marvelous rate and it is estimated that no less than 50,000 tons of finished material now awaits shipment. The coke situation has been somewhat relieved during the week and not more than five furnaces are banked or out of blast in this district and the two Valleys on account of the lack of a proper coke supply. However, the furnaces in operation are running very close and it will be some time before the supply of coke required at any furnace for its proper operation will again be secured.

The pig iron market continues to show great strength and all grades of iron have an upward tendency. No. 2 foundry iron for delivery during the next three months was sold at $16 per ton, Pittsburg, during the week while a large lot of forge iron brought $15. Small lots of Bessemer iron were sold at $16.40 to $16.65 per ton and other grades brought proportionately high prices. The call for foundry iron for prompt shipment is very large and the present high prices are in a measure due to this demand. There is also a large demand for iron for delivery during the first half of next year and the furnacemen are inclined to hold back quotations, believing that prices will go still higher before the first of the year. It is altogether probable that the United States Steel Corporation will purchase Bessemer iron this week to cover its requirements during the first quarter of next year, as a meeting of the furnacemen's committee has been called for this purpose on Thursday of this week. The Bessemer association has practically decided to quote $15.25 per ton for this iron at the furnace, or $16, Pittsburg. This price will have a tendency to hold down the pig iron market generally.

Demand for finished material is fair, but the big tonnage on the books of all the plants insures their full operation far into the first half of next year. The plate market is reported to be in better condition than for several months, a contract from the American Shipbuilding Co., and several 1,000-ton contracts from tank and boiler manufacturers helping the situation. A meeting of the plate interests will be held in New York this week, but no change in prices is anticipated.

Demand for structural material continues strong and from reports received this week from the structural mills of the country indicate a record-breaking output. With the large amount of business already booked, some of the contracts covering the first half of next year, it is believed that 1902 will even eclipse this year's record. There is an impression that there will be an advance in the price of all kinds of structural material at the meeting of the manufacturers to be held this month, both on account of the large amount of business booked and because of the relation of present prices to those of other finished materials. On the other hand the great danger of cutting off building projects is strongly urged against an advance.

The wire nail market still shows sharp cutting and sales

have been freely made during the week at $2.05 to $2.10 per keg. Plain wire has also dropped in sympathy with wire nails. Many buyers of the latter product are holding off anticipating still lower prices.

PIG IRON.—Thousands of tons of pig iron are on the tracks of the railroads in this district awaiting delivery to foundries and steel plants, but owing to the switchmen's strike and the inadequate track facilities deliveries cannot be made. A number of foundries were compelled to shut down for periods ranging from two to four days last week, owing to the lack of raw material and there is not much relief in sight. Prompt iron, both Bessemer and foundry, is in big demand and premiums are being paid for shipment within two weeks. We note the sale of 200-ton lots of Bessemer iron at prices ranging from $16.40 to $16.65, Pittsburg, for delivery within two weeks. We also report the sale of 5,000 tons of forge iron for delivery the first quarter of next year at $15, Pittsburg. Small lots of No. 2 foundry have been sold during the week for delivery up to the first of the year at prices ranging from $15.75 to $16 per ton. From the furnaces in the Mahoning and Shenango Valleys it is reported that stocks are exceedingly low and will probably be entirely cleaned up before the end of the week. We revise quotations as follows:

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|---|---|
| Bessemer, Valley | $15 25 to 15 90 |
| Bessemer, Pittsburg | 16 00 to 16 65 |
| No. 1 Foundry | 15 75 to 16 25 |
| No. 2 Foundry | 15 75 to 16 00 |
| No. 3 Foundry | 15 00 to 15 20 |
| Gray Forge, Pittsburg | 14 75 to 15 00 |
| Chilled Basic, Valley | 15 00 to 15 25 |
| Chilled Basic, Pittsburg | 15 75 to 16 00 |

STEEL.—Both Bessemer and open-hearth billets continue scarce and much in demand. Small lots continue to bring $27.50 to $28 per ton. There is little demand for billets for delivery next year, some consumers believing that somewhat better prices than prevail at present can be secured by holding off. On the other hand steel companies are not offering billets and in some cases have declined to quote for next year. The demand for rods continues fair and sales are being made at $33 per ton.

FERRO-MANGANESE.—The largest producer continues to quote $53.50 per ton for 80 per cent domestic, in carload lots delivered at buyer's mill, while foreign continues to be offered at $50 per ton.

SPELTER.—There is an unusually good demand for spelter and prime Western grades are held at 4.25c to 4.30c, Pittsburg.

MUCK BAR.—We note the sale of 5,000 tons of muck iron at $29.50 per ton.

SKELP.—A fair demand continues for skelp and steel, grooved and sheared is quoted at 1.70c to 1.75c, while iron is held at 1.80c to 1.85c.

RAILS AND TRACK MATERIAL.—It is announced that the rail mill of the National Steel Co., Youngstown, O., will be placed in operation about the first of the year. The tonnage already allotted this mill will keep it in full operation for months. We make the following quotations: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $42; 12 pounds, $38; 16 pounds, $35; 20 pounds, $34; 25 to 40 pounds, $32. Track material: Spikes, 1.95c to 2c; track bolts, square heads, 2.40c; hexagon heads, 2.55c; fish plates, 1.50c to 1.60c.

PLATES.—Contracts placed by the American Shipbuilding Co. and by tank and boiler manufacturers have relieved the plate market considerably and it is stronger than in several months. A meeting of the plate manufacturers will be held this week but no change in prices will be made. We make the followng quotations: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox. A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c; and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $1 extra; gauges Nos. 7 and 8, $3 extra; No. 9, $5 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash in 30 days.

BARS.—While the amount of new business in both iron and steel bars is not large the mill continues to operate in full and on nearly all sizes deliveries are two months behind. Our quotations are as follows: Common iron bars, 1.50c, Pittsburg, for Western delivery and 1.55c, Pittsburg, for Eastern delivery; refined iron bars, 1.75c and upwards; Bessemer steel bars, 1.50c; open-hearth, 1.60c; plow beams and cultivator beams, 1.50c, net; channels, angles, zees and tees, Bessemer under three inches, 1.60c; over 3 inches, 1.70c. Hoops and bands are quoted at 1.90c, full extras.

PIPES AND TUBES.—The demand for pipes and tubes has fallen off somewhat during the past week, which is always expected at this season of the year. A large amount of future business is being carried by the mills and shipments still continue several weeks behind. Discounts to consumers in carload lots, Pittsburg, are as follows:

MERCHANT PIPE.

| | Blk. Per cent. | Galvd. Per cent. |
|---|---|---|
| ⅛ to ¼ and 11 to 12 inches | 61 | 48 |
| ¼ to 10 inches | 68½ | 56 |

BOILER TUBES.

*Steel.*

| | Per cent. |
|---|---|
| 1 to 1¾ inches | 47½ |
| 2¼ to 5 inches | 65½ |
| 1¾ to 2¼ and 6 to 13 inches | 60 |

*Iron.*

| | Per cent. |
|---|---|
| 1 to 1¾ and 2¼ inches | 43½ |
| 1¾ to 2¼ inches | 43 |
| 2¼ to 13 inches | 53 |

CASING.

| | S. and S. Per cent. |
|---|---|
| 2 to 3 inches | 58 |
| 3¼ to 4 inches | 63 |
| 4¼ to 12¼ inches | 65 |

SHEETS.—Deliveries on the heavier gauges of sheets still continue from two to three months behind. On the lighter gauges better deliveries can be made. The following quotations are made to consumers: Blue annealed sheets, Nos. 10, 11 and 12, 2.40c; Nos. 14 and 15, 2.50c; Nos. 16 and 17, 2.60c. One pass through cold rolls: Nos. 18, 19, 20 and 21, 2.50c; Nos. 22, 23 and 24, 2.80c; Nos. 25 and 26, 2.90c; No. 27, 3c; No. 28, 3.10c; No. 29, 3.25c; No. 30, 3.35c. On lots less than 500 bundles the American Sheet Steel Co. does not make shipments except through jobbers. Galvanized sheets are quoted at 70 and 10 off; galvanized sheets for spot shipment, at 70 off. Prices to jobbers are somewhat lower than the above.

STRUCTURAL MATERIAL.—It is now estimated that the production of structural shapes this year will break all previous records. Orders are still coming in freely. Prices remain unchanged as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles, from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—The wire nail market shows generally lower prices. Sales have been freely made during the week at $2.05 to $2.10 per keg and it is believed by the consumers that prices will ultimately reach $2 per keg. The price of cut nails is being firmly maintained. We make the following quotations: Single carloads of wire nails to jobbers at $2.05 to $2.10 and less than carloads at $2.20 to $2.25; plain wire, carload lots, is quoted at $2.20 to $2.25 to jobbers and $2.30 to $2.35 to retailers; painted barb wire, $2.60 in carload lots to jobbers, and $2.70 to retailers; galvanized barb wire, $2.85 to $2.90 in carload lots to jobbers, and $3 to retailers. Cut nails are quoted at $2.05, Pittsburg, in carload lots, and $2.10 to $2.15 in less than carload lots, 2 per cent off in 10 days.

MERCHANT STEEL.—There has been considerable buying of shafting during the week, but prices have not been stimulated to any great extent. The demand for crucible steel for delivery next year is good. We make the following quotations: Turned, cold rolled and ground shafting 60 and 62½ per cent off for car lots and 55 to 57½ per cent off for less than car lots; tire steel in carload lots and over, 1.60c; less than carload lots, 1.75c to 1.80c. Toe calk is sold at 1.70c, in large lots, and in small lots as high as 1.85c. Tool steel is held at 7c and upwards, according to quality.

OLD MATERIAL.—Large consumers of old material have as yet failed to reach an agreement as to a buying policy. Dealers in this material are skeptical and do not believe that one can be formulated that will work satisfactorily. We quote for gross tons, as follows: Heavy melting stock, $16.50 to $17; low phosphorus melting stock, $18 to $18.50; steel

rails, $17 to $17.25; busheling scrap, $13 to $14; No. 1 wrought, $17 to $17.25; iron rails, $21 to $21.25; cast borings, $8.25 to $8.50; cast scrap, $14 to $14.25.

COKE.—For the week ending Saturday, Nov. 23, the total estimated production of the Connellsville region amounted to 236,527 tons, an increase of nearly 400 tons over the production of the previous week. The output of the region is now greater than ever before, thus proving conclusively that the consumption of coke is greater than ever before in the country's history. Connellsville furnace coke for delivery next year is quoted at $2 per ton, and foundry coke at $2.50 per ton. Outside furnace coke is held at $1.75; foundry, at $2.10 to $2.25 per ton.

## CHICAGO.

OFFICE OF *The Iron Trade Review*,
534 MONADNOCK BLOCK, Dec. 3

No signs are evident of any reduction in the demand for all classes of iron and steel in this territory, which continues unprecedentedly large, though signs pointing to a reduction in the output of metal from furnaces and mills seem to multiply owing to one cause or another. Following close upon the Amalgamated strike in the summer, and just as manufacturers were catching up on delayed shipments, came a shortage of cars, and this has recently been aggravated by the switchmen's strike in Pittsburg, which has tended still further to tie up product in the mills. Local jobbers and agencies of Eastern mills report that though this strike was but temporary it greatly curtailed shipments to this territory; as a result, there is a greater demand from jobbers' stocks and a more complicated shipment problem to solve. The shortage of cars still continues to interfere seriously with the consumption of both pig iron and finished material, some Southern furnaces reporting that they are accumulating stock in their yards, for which they have orders, but cannot ship. Many foundries report also that they either have shut down or will have to do so unless they promptly receive both coke and iron. The local seller of Northern iron whom we reported last week as having withdrawn from the market until connected furnaces were assured of a permanent supply of coke, still refuses to take new business. In all other departments of the iron and steel industry there is the same insistent demand for material and calls for immediate shipment.

PIG IRON.—While individual sales of pig iron during the past week have not been large, the aggregate tonnage keeps up with former proportions. Consumption has been seriously curtailed owing to the inability of foundries to get a sufficient supply of coke, which has compelled some shops to shut down. For the same reason a number of furnaces in this territory have been compelled to go out of blast, withdrawing from this market between 3,000 and 4,000 tons of pig iron per week, and the company handling this product has announced that it is not accepting orders for any more new business, unless for shipment next year, until its furnaces are guaranteed a sufficient supply of coke to keep them in blast. Any amount of business is being offered for prompt shipment, and some contracts are also being taken for delivery of material all through next year. We quote as follows:

| | | | |
|---|---|---|---|
| Lake Sup. Charcoal | $18 00 to $19 00 | Southern Coke No. 4 | $14 15 to $14 40 |
| Local Coke Fdy. No.1 | 16 00 | Southern No. 1 Soft | 15 65 to 15 90 |
| Local Coke Fdy. No.2 | 15 50 | Southern No. 2 Soft | 15 15 to 15 40 |
| Local Coke Fdy. No.3 | 14 50 to 15 00 | Southern Gray Forge | 14 15 to 14 40 |
| LocalScotchFdy.No.1 | 15 50 to 16 00 | Southern Silveries | 15 90 to 16 40 |
| LocalScotchFdy.No.2 | 15 00 to 15 50 | Jackson Co. Silveries | 17 00 to 17 50 |
| LocalScotchFdy.No.3 | 14 50 to 15 00 | OhioStrong Softeners | 16 50 to 17 00 |
| Southern Coke No. 1 | 15 90 to 16 15 | Alabama Car Wheel | 20 50 to 21 00 |
| Southern Coke No. 2 | 15 15 to 15 40 | Malleable Bessemer | 16 00 to 16 50 |
| Southern Coke No. 3 | 14 65 to 14 90 | Coke Bessemer | 17 50 to 18 50 |

BARS.—It is reported that the American Car & Foundry Co. is making inquiries on 25,000 tons of iron, delivery to commence right away. The market has taken on more life since our last report, inquiries and orders having greatly increased. December, however, is always a quiet month, as jobbers and consumers generally take inventory of stock. We quote iron and steel bars 1.65c, Chicago; out of store, 2c.

SHEETS.—There is no change to report. Both mills and jobbers are doing all the business they can possibly handle, and are well satisfied with the outlook. The switchmen's strike in Pittsburg delayed shipment of material to this territory, which in most cases is urgently needed. Plenty of new business is being offered, though mills are at least three months behind in deliveries. We quote No. 27 black, 3.60c to 3.70c, and galvanized, 70 per cent to 65 and 10 per cent.

BILLETS.—Actual transactions are limited to small lots, and these are only made in special cases. We quote Bessemer billets $31 to $33, and open-hearth, $33 to $35.

STRUCTURAL STEEL.—Reports are in circulation that new buildings are contemplated in Chicago that will require between 8,000 and 10,000 tons of structural shapes. All sellers unite in the view that business could not possibly be better, there being an excellent demand for all kinds of material. We quote mill shipments, carload lots as follows: Beams, 15 inches and under, 1.70c; 18 inches and over, 1.85c; angles, 1.75c to 1.80c; plates, 1.75c, base; tees, 1.80c; zees, 1.75c; small lots from store, ¼c higher; beams and channels from store, ⅛c to ¼c per pound higher.

RAILS AND TRACK SUPPLIES.—The local interest last week refused a number of orders for standard rails, owing to its capacity on the sizes wanted having been taken for the entire year. All the mills of the United States Steel Corporation are practically filled up with orders for next year. Demand for track supplies and light rails shows no diminution, though no large individual orders have been placed of late. We quote as follows: Standard rails, $28; light sections, $34 to $36, according to size; out of store, $40 to $44; splice bars, 1.60c to 1.70c; spikes, 1.90c to 2c; out of store, 2c; track bolts, hexagon nuts, 2.80c to 2.90c; out of store, 2.90c to 3c; square nuts, base, 2.65c to 2.75c; out of store, 2.75c to 2.85c.

MERCHANT STEEL.—Though new business is constantly being taken, mills are crowded with work and are not seeking orders. Our quotations for mill shipments, Chicago delivery, follow: Smooth finished tire steel, 1.90c to 2c; open-hearth spring steel, 2.50c to 2.75c; toe calk, 2.40c to 2.60c; sleigh shoe, 1.85c to 1.90c; cutter shoe, 2.40c to 2.60c; ordinary tool steel, 6c to 7c; specials, 13c and upwards. Cold-rolled shafting, carload lots, 55 per cent; less than carload lots, 50 per cent.

PLATES.—A large contract for plates was placed last week by the Chicago Shipbuilding Co., about 2,000 tons of which will go to the Illinois Steel Co. The local plate mill was shut down last week for repairs, and will probably remain idle the rest of the week. Our quotations follow: Tank steel, base, ¼-inch, 1.75c; flange steel, 1.90c to 2c; marine steel, 1.95c; firebox steel, ordinary, 2c to 2.10c; special, 2.25c and upwards. Tank steel from store, 2c to 2.20c; flange steel from store, 2.25c.

CAST IRON PIPE.—There is a fairly good demand for pipe, in small lots, but owing to the fact that this is the dull season, the demand comes from jobbers' stocks mainly. We quote as follows: 4-inch water pipe, $29, carload lots, f. o. b., Chicago; 6-inch water pipe, $28; 8-inch and larger sizes, $27; gas pipe, $1 per ton higher than above prices.

MERCHANT PIPE AND BOILER TUBES.—There is a good demand from jobbers' stocks, which is due in the main to the many new buildings that are being erected in this city and contiguous territory. Our quotations follow:

MERCHANT PIPE, RANDOM LENGTHS.

| | Black Per cent. | Galv. Per cent. |
|---|---|---|
| ⅛ to ⅜ and 11 to 12 in | 59.5 | 46.5 |
| ½ to 10 inches | 67 | 54.5 |

BOILER TUBES.

| | Steel Per cent. | Iron Per Cent. |
|---|---|---|
| 1 to 1¼ in | 40 | 35 |
| 1¼ to 2½ in | 45 | 40 |
| 2¾ to 5 in | 55 | 50 |
| 6 in. and larger | 45 | 40 |

WIRE AND WIRE NAILS.—There is still a heavy demand for all kinds of wire product, which continues to tax the entire capacity of Western mills, preventing them from accumulating any stock. Shipments of material are being delayed owing to the shortage of cars, but with this embargo removed, a better condition of trade could not be imagined or desired. We quote carloads of wire nails to jobbers, $2.40, Chicago; to retailers, $2.50; plain wire, carload lots to jobbers, $2.35; to retailers, $2.45; painted barb wire to jobbers, carloads, $2.70; to retailers, $2.80; galvanized barb wire, carloads to jobbers, $3; to retailers, $3.10.

COKE.—The coke trade in this district is in a very unsatisfactory condition, so far as delivery is concerned. No shipper is getting his full quota of cars, and many foundries and furnaces have consequently been seriously crippled. One large

dealer in coke reports that they need 75 cars per day to fill orders, but instead of this amount the company have received not more than 15 cars per day on an average. Connellsville coke has commanded as high as $6 per ton in this market, though $5 to $5.50 is the average price. Dorian coke, 72-hour foundry, $5 to $6.

OLD MATERIAL.—The market is not especially active, though some sales are reported. There is a feeling among dealers that prices may go lower, and quotations are shaded. We quote as follows:

| | | | |
|---|---|---|---|
| Old iron rails | $21 00 to $21 50 | Old Wheels | $16 00 to $16 50 |
| Old steel rails, long | 18 50 to 19 00 | Heavy melting steel | 13 50 to 14 25 |
| Old steel rails, mixed | 13 50 to 14 50 | Mixed country steel | 10 50 to 11 00 |
| Relaying rails | 26 00 to 27 00 | | |

The following are net selling prices per ton:

| | | | |
|---|---|---|---|
| No. 1 R. R. wrought | $16 00 to $16 50 | Iron axles | $20 00 to $21 50 |
| No. 2 R. R. wrought | 13 25 to 13 75 | Cast borings | 4 50 to 5 25 |
| Dealers' forge | 13 00 to 13 50 | Wrought turnings | 11 50 to 12 00 |
| No. 1 busheling | 11 00 to 11 50 | Iron axle turnings | 12 00 to 12 50 |
| No. 1 R. R & mach. cst. | 12 00 to 12 50 | Steel axle turnings | 10 50 to 11 50 |
| Railway malleable | 12 00 to 12 50 | Stove plates | 8 50 to 9 00 |
| Country malleable | 11 50 to 12 00 | Old iron splice bars | 16 00 to 16 50 |

## CLEVELAND

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Dec. 4.

Ore shipments from Duluth and Two Harbors are over, Ashland has sent out the last ore in the past two days, and at other ports the present week will probably see the end. Counting in the shipments from Michipicoten bay, of which about 75,000 went to Canadian furnaces and about 160,000 to Lake Erie ports it is probable that the total will run above 20,500,000 tons. There is some further talk of prices for next year's ore and it is understood that some sales have been made chiefly of Mesabi ores. The Stevenson ore, for example, which promises an output of 1,500,000 tons in 1902, is offered at $3 for next year as against $2.75 this year, and the advance is in line with what is expected in the case of the best Mesabi Bessemers. Some good records are being made in the use of Mesabi ores whose physical condition compares favorably with old range ores, as high as 85 per cent being used in some instances. The Mesabi output promises to be about 45 per cent of the total this year, and may exceed 9,000,000 tons.

No conferences on old-range Bessemer ores are talked of as yet, and the aspect of the finished material market in the early part of the new year is likely to be consulted before any definite action is taken on prices. The expectation now is that there will be little if any deviation from the base price of 1901.

PIG IRON.—Foundry buying is light for two reasons. There is no iron to be had for delivery this year and nearly all buyers have contracted for their supply for the first few months of 1902. Most furnaces have sold two-thirds of their output in the first half of 1902, and all have some orders extending over the entire six months. In a few cases contracts have been made running through the year. The coke supply is only slightly better, and the record for November will show a sharp falling off in output. Lake Superior charcoal iron is higher. The demand in the past two or three months is the largest ever known and it is almost impossible to get iron for December delivery. The largest producer, with five furnaces active, has made very heavy sales for the first half of 1902. We quote $18 to $18.50 at Lake Erie port. Cleveland quotations follow:

| | | | |
|---|---|---|---|
| Bessemer | $16 00 to $16 25 | Scotch No. 1 | $16 00 to $16 25 |
| No. 1 Strong F'dry | 16 00 to 16 25 | Scotch No. 2 | 15 50 to 1575 |
| No. 2 Strong F'dry | 15 50 to 15 75 | Gray forge, Valley | 14 00 to 14 25 |
| No. 3 Foundry | 15 00 to 15 25 | LakeSuperior charc'l | 18 00 to 18 50 |

FINISHED MATERIAL.—A car ferry steamer for the Pere Marquette Railway Co. and a 376-ft freight steamer for parties whose names are not given, have been placed with the American Shipbuilding Co. this week, making 34 vessels this company has under contract for 1902, or seven to eight months' work. The plates for one of the two vessels just contracted for have been bought at Chicago, where the boat will be built. The steady buying of plates by the shipbuilding company has put the mills on a better footing, and from the same source has come a good tonnage of shapes, which has added to the congestion in that end of the market. Structural works and engineering concerns have been good buyers of shapes of late, a number of local contracts calling for deliveries in the first half of 1902 having been placed. It is recognized that present prices will hold, in any event, and contracts are being made now so that material can be had when needed. In bars buying is light and this is true also of new business in sheets, but bar mills and sheet mills are so full of work that there is no concern about new business. Prices are strong and unchanged, bar iron and steel selling at 1.50c Pittsburg, 1.54½c Valley mill and 1.58½c Cleveland in carload lots. We continue to quote sheets at 3c mill for No. 27, one pass through cold rolls and 3.10c for No. 28.

OLD MATERIAL.—There is a steady market, and in view of the recent efforts by both sellers and consumers to do some regulating of prices fluctuations are in narrow limits. We make a slight change in prices, advancing car wheels, reducing cast borings, shading the maximum quotation for mill scrap, and raising the maximum for machine cast scrap:

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|---|---|
| Old steel rails, rolling mill lengths | $17 00 to 18 00 |
| Old steel rails, short lengths | 16 50 to 16 75 |
| Iron rails | 21 00 to 21 00 |
| No. 1. railroad wrought | 16 50 to 17 00 |
| Mill scrap | 14 50 to 15 00 |
| No. 1. machine scrap | 14 00 to 14 50 |
| Cast borings | 7 00 to 7 50 |
| Grate bars | 9 00 |
| Sheet iron | 9 00 to 10 00 |
| Stove plate | 10 00 to 10 50 |
| Car wheels | 16 00 |

## CINCINNATI.

Dec 3

Firmness characterizes the entire iron situation in this district. Among the furnaces there is the same trouble about getting coke, the same trouble about the delivery of iron and the same condition of production running behind consumption. As for buyers, one large concern is just about to close a contract for the last half of 1902, which shows how some consumers look at it.

In the machine tool market, that can safely be taken as a good criterion in this district, deliveries are so far behind that one of the large machine tool concerns has brought the wrath of some of its agents down on it because it does not show enough eagerness for new business. In finished material, there is the same sort of firmness, the complaint being that there is not enough raw steel to go around and that in consequence there is a shortage in production of finished forms.

Manufacturing concerns in all lines are finding it necessary to extend their floor space and build extensions and additions, and they are running up against the same story that they themselves have been telling, and that is that they will be fortunate if they get the iron and steel to go into their new buildings when needed. One machine tool man declared that it had become quite the thing to be behind in deliveries in all lines of business. He told of a ladies' custom tailor whom his wife wished to have make her a new suit. "I can take your order, madam," he said, "but I can not promise you delivery of the suit until March." It sounded quite natural to a man engaged in any branch of the iron trade.

PIG IRON.—The best index of the situation in the pig iron market is the statement above that one of the largest consumers is in the market for iron for delivery during the last half of 1902. The transaction has not been closed up as yet, but it will be ere this is in print. The significant thing about it is that the furnace is the one holding back. The price quoted by the pig iron producer is all right and the consumer wants to close the contract right now. The consumer says that it has made contracts for its product to cover the period on which it wants iron and it is ready to contract at the price specified because it can get out whole if it does nothing more. The iron wanted is of diversified grades.

Another significant thing is the fact that one pig iron firm in Cincinnati alone has standing in the yards of the Louisville & Nashville railway just across the river 100 cars of pig iron that is blockaded because the Northern roads are not able to get to it to transfer it. Thus the car situation remains about as bad as it was, if not even worse in some respects. The traffic is now so heavy on many of the roads that it has been suggested in all seriousness that it would be the best thing if passenger traffic could be stopped for a while in order to let the freight trains move without hindrance.

The general business in pig iron is not marked by large

orders, but there is a good aggregate of small ones that brings the total about up to what it has been all along. Probably the largest order placed in the week was for 2,500 tons. Buying is well distributed through the list. While prices hold up firmly there is no indication of an immediate advance. Quotations on various grades f. o. b. Cincinnati are:

| | | | |
|---|---|---|---|
| Southern Fdy. No. 1 | $14 50 to $14 75 | Gray Forge | $13 00 to $13 25 |
| " " 2 | 14 00 to 14 25 | Northern Fdy. No. 1 | 16 25 to 16 50 |
| " " 3 | 13 50 to 13 75 | " " 2 | 15 75 to 16 00 |
| " " 4 | 13 00 to 13 25 | Charcoal C. W. iron | 17.75 to 18 25 |
| So. Fdy. No. 1 soft | 14 50 to 14 75 | Malleable coke iron | 15 25 to 15 75 |
| So. Fdy. No. 2 soft | 14 00 to 14 25 | | |

FINISHED MATERIAL.—Deliveries of bar iron and bar steel are not as dilatory as on some other sorts of finished material, but there is scarcely the capacity to turn out the product that the demand would justify. There has been a feeling that the short supply of steel would force things up, and the head of one of the large companies with branches through the Central States and South has expressed the opinion to a local representative that the finished material market will move up much easier and sooner than it will move down. That is as strong as he would put it. Buying has been good and there has not been much of a let up because the end of the year is in sight. A large buyer asked the mill to guarantee prices on a contract for delivery during the next few months. The mill replied that it would rather not have the business. After some delay the buyer replied that he would take the stuff anyway, guarantee or not. Prices at Cincinnati in car load lots are: Iron bars, 1.62c; steel bars, 1.62c; angles, 2c; plates, 1.85c to 1.90c; sheets, No. 28, 3.35c to 3.40c; No. 12, blue annealed, 2.35c.

OLD MATERIAL.—There has been practically no change in the scrap market. The movement has not been heavy and the offerings have been but moderate, the market evidently being gauged by experienced hands. Melters find no difficulty in getting what they want though there is really no weakness apparent. Prices remain at about the same figures, as follows:

| | |
|---|---|
| Old No. 1 Wrought Railroad | $ 15 25 to 15 50 |
| Cast Machine and Foundry | 12 50 to 12 75 |
| Old Iron Rails | 20 25 to 20 75 |
| Old Steel Rails | 15 50 to 16 50 |
| Old Short Lengths | 14 00 to 14 25 |
| Old Iron Axles | 20 25 to 20 75 |
| Old Iron Car Wheels | 16 00 to 16 25 |
| Stove Plates | 9 75 to 10 00 |
| Wrought Turnings, net tons | 11 25 to 11 75 |
| Cast Borings, net tons | 5 50 to 6 00 |

## PHILADELPHIA.

Dec 3.

There is really very little to tell concerning any department of the iron and steel trades. Continued activity and strength are shown in nearly every important transaction, and if anything is more pronounced than heretofore. As yet it is more a question of filling orders within a reasonable length of time than it is of securing them. In spite of increased capacity demand shows no abatement. Altogether it is an extraordinary wave of prosperity, and while no one can say how long it will last, there can be no harm in saying that the indications of its permanency were never stronger than today. The railroads are compelled to give out orders with a freer hand than usual, thus adding to the general congestion. In view of the general shortage of material it seems almost out of the question to look for any general slacking up for a long time to come. The volume of business is on the increase, with no indication that supply is overtaking demand.

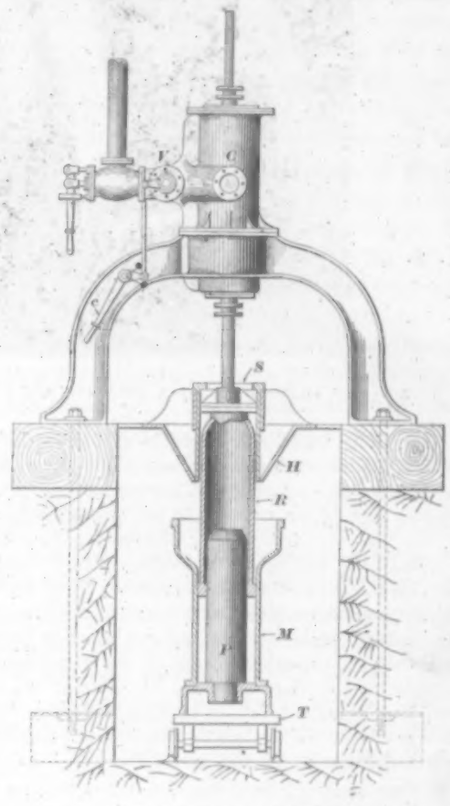
PIG IRON.—Although quotations are not appreciably higher than they were a week ago, yet the scarcity of iron for prompt shipment is accentuated and sellers, even for business calling for three to six months delivery, are holding out for full prices. At present the market is distinctly favorable to the seller. Under ordinary circumstances present conditions would be considered favorable to the placing of orders, but the more than usual conservatism shown by buyers, may require from four to five weeks' time to develop the actual strength of the market. Prices are about the same as last week with sales on a fairly liberal scale at about the following quotations for Philadelphia and nearby points: No. 1 X foundry, $15.75 to $16; No. 2 X foundry, $15.50 to $15.75; No. 2 plain, $15 to $15.25; Standard gray forge, $14.25 to $14.50; ordinary gray forge, $13.50 to $13.75; basic (chilled), $14.25; Bessemer, $15.75 to $16.

FINISHED MATERIAL.—The plate mills have received some fair-sized orders, which keep them comfortably employed, although not working under the pressure witnessed in other departments. Structural material is as yet commanding a premium, depending upon circumstances, time of delivery being the influencing factor. Some irregularity is noted in the price of bars made by mills outside the association. Deliveries are fairly regular and likely to continue so. Sheets are in good demand and customers are as yet unsatisfied with deliveries being made. We quote for seaboard and short distance deliveries: Plates, ¼-inch and thicker, 1.75c to 1.80c; bars, iron or steel, 1.62½c to 1.70c; angles, 1.75c to 1.85c; beams and channels, 1.75c to 1.85c.

OLD MATERIAL.—The market shows but little change, bids and offers for deliveries in buyers' yards being about as follows: Choice railroad scrap, $20 to $21; ordinary light scrap, $12.25 to $12.75; machinery cast, $13.75 to $14.25; heavy steel scrap, $17.50 to $17.75; old iron rails, $21 to $21.50; old steel rails, short lengths, $17 to $17.50; wrought turnings, $12.50 to $13; cast borings, $8 to $8.25; old car wheels, $15.75 to $16.25; old iron axles, $23 to $24; old steel axles, $19.50 to $20.50.

## A PIPE MOLDING MACHINE.

Shepherd & Leigh of Stockport, England, have secured a patent on their machine, illustrated herewith, which has for its purpose the molding of water and gas pipes and the making of cores for the same by a more rapid method than is now in vogue. The inventors claim that six molds or cores for 24-inch pipe may be made with these machines in five minutes. In the machine shown, but one ramming head




A PIPE MOLDING MACHINE.

is provided, although in practice it is intended to place six rammers on each machine and in this way ram six molds simultaneously.

In the illustration C is a vertical cylinder. R is the rammer proper which is fastened to the piston rod S. H. is a hopper through which the sand is supplied to the mold. P. is the pattern and N the flask supported on the carriage T. Each hopper of sand is given three blows by the rammer and is calculated to fill a space about a foot high in the mold. Not only is this machine intended for the making of molds, but also for the ramming of cores. In this case the flask is

replaced by a core box and the pattern by a core barrel. The inventors say that with six of these rammers going at once and ramming up a foot of pipe or core at a time, it will not take long to complete a mold, which is probably true. With one set of flasks it is intended to make five sizes of pipes. It is also claimed that the same flask and patterns will do for making either socket, spigot, or flange pipe and that a saving will thereby be effected.

In making cores it is also intended to use one set of core barrels for five different sizes of pipe. As the cores made by this method will remain in a vertical position from the time they are made until the mold is poured, it is claimed that they can be handled quicker and that no hay rope will have to be employed on the barrels. In short, instead of making loam cores, it is proposed to make what is properly called a dry sand core which will require less fuel and time in drying. —[The Foundry.

## Obituary.

Clement Studebaker, president of the Studebaker Bros. Mfg. Co., South Bend, Ind., died on Nov. 27, aged 70 years. His father was a blacksmith and wagon maker and the son engaged in that business in 1852, with an elder brother Henry. Five brothers were connected with the extensive wagon works at South Bend, which were the outgrowth of the modest blacksmith shop of the early fifties. But one of the five survives. The Studebaker Bros.' Mfg. Co. was incorporated in 1868. Clement Studebaker was a prominent Republican, a delegate to two National conventions of the party and was also high in the councils of the Methodist Episcopal church. He was president of the Chautauqua Assembly.

Capt. James W. Porter, of Sewickley, Pa., a suburb of Pittsburg, died in New York on Wednesday, Nov. 27, having gone to that city about three weeks ago to be treated. He was born in New York 72 years ago and about 50 years ago went to Pittsburg, where he engaged in the river trade. After disposing of his river interests he engaged in the oil trade and later became a broker in iron and steel. In 1885 he became president of the Carroll-Porter Boiler & Tank Co., which succeeded the B. W. C. Carroll Co.

N. & G. Taylor Co. of Philadelphia are making extensive additions and improvements to their works. They are building another mill at Cumberland, Md., which will give them eight mills. They also have other improvements in contemplation there. At their tin plate works in Philadelphia they are making extensive alterations and building a very large warehouse, equipped with electrical elevators for the rapid handling of the product. The box department and the black plate department are also being enlarged and another story added to this building. They are also enlarging their smelting works to meet the demand for their makes of solder, Babbitt metals, etc.

## IRON AND STEEL STATISTICS FOR 1900.

"Statistics of the American and Foreign Iron Trades for 1900," the annual statistical report of the American Iron and Steel Association has just come from the press. It is a pamphlet of 70 pages and is probably the most complete and in all respects the best statistical commentary on a year's iron trade that General Manager Swank has produced. It is fitting that the last year of the 19th century should be thus signalized. A copy of the report reaches us on the day of going to press and we have only opportunity to refer to it briefly. Most of the more important statistical tables have been reproduced in these columns from various issues of the *Bulletin* of the Association.

The production of all iron and steel rolled into finished forms in the United States in 1900 was 9,487,443 gross tons, against 10,294,419 tons in 1899, a decrease of 806,976 tons, or over 7.8 per cent.

The production of plate and sheet iron and steel in 1900, including nail plate, amounted to 1,794,528 gross tons, against 1,903,505 in 1899. Skelp is not included in the above.

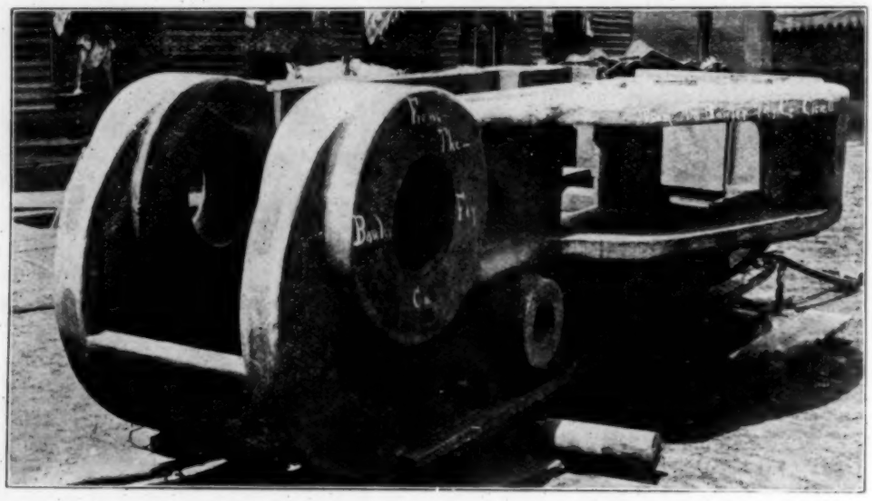
The production of tin plates and terne plates in 1900 was 302,665 tons, against 360,875 tons in 1899, and 326,915 tons in 1898.

The following table gives the number of blast furnaces, rolling mills and steel works and their production in gross tons, in Allegheny county, Pennsylvania, in the past four years:

| Details—Gross Tons. | 1897 | 1898 | 1899 | 1900 |
|---|---|---|---|---|
| Furnaces built and building...No. | 30 | 31 | 34 | 34 |
| Production of pig iron | 2,663,093 | 3,022,901 | 3,255,678 | 3,118,761 |
| Rolling mills and steel works, No. | 61 | 60 | 63 | 61 |
| Production of Bessemer steel | 2,061,837 | 2,338,087 | 2,606,220 | 2,318,871 |
| Production of open-hearth steel | 725,262 | 1,042,350 | 1,470,271 | 1,680,249 |
| Production of crucible and other steel | 42,231 | 52,352 | 58,426 | 52,188 |
| Total production of steel | 2,829,330 | 3,432,789 | 4,134,917 | 4,051,308 |
| Production of rails | 538,798 | 564,085 | 606,017 | 631,467 |
| Production of structural shapes | 367,702 | 451,323 | 529,979 | 475,572 |

Allegheny county produced in 1900 over 22 per cent of the total production of pig iron in the United States; over 34 per cent of the total production of Bessemer steel ingots and castings; over 49 per cent of the total production of open-hearth steel ingots and castings; almost 52 per cent of the total production of crucible steel; over 39 per cent of the total production of all kinds of steel; over 26 per cent of the total production of Bessemer steel rails; over 58 per cent of the total production of structural shapes; and about 33 per cent of all rolled products.

According to reports issued by the Southern Iron Committee, there was shipped from Alabama and Tennessee during the first 10 months of the year, 1,393,987 tons of pig iron, cast iron pipe and steel. Of this amount there were 1,254,596 tons of pig iron, 139,391 tons of cast iron pipe. The steel shipments from Ensley, near Birmingham, during the first 10 months of the year, amounted to 47,954 tons.



A 15-TON CASTING FOR AJAX BOLT-HEADING MACHINE. PRODUCED BY THE BOWLER FOUNDRY CO., CLEVELAND

# THE IRON TRADE REVIEW

**Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.**

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DECEMBER 5, 1901.


## THE LINES OF FUTURE ADVANCE IN STEEL.

The progress of iron and steel metallurgy in scarcely more than a decade is well brought out by the decadence in interest in processes for the production of steel direct from the ore. There was a time when there was a reasonable expectation that the process of the future would be a direct one, this expectation being aparently supported by estimates of probable cost. But there is now no such expectation, unless it refer to the utilization of ores much purer than those found in commercial quantities in the United States. The change in the outlook has come wholly from the progress which has been made, not in the chemical problems involved in either the blast furnace or the steel making department, whether Bessemer or open-hearth, but in the reduction in labor cost and fixed charges per ton of output.

Ten years ago it was shown on paper, and it is claimed also by actual experiment, that high grade steel could be produced by a direct process at slightly less cost than ordinary Bessemer steel, which meant at much less cost than the open-hearth steel of that day. The proposed direct processes of that time were compared with Bessemer and open-hearth steel practice quite different from what we have today. These processes have made wonderful advancement, of which the direct process was not capable, and it has therefore been eliminated from the reckoning under the conditions which exist today.

In 1890 the percentage of loss of iron in the blast furnace was much higher than it is today, and losses in the open-hearth furnace and converter were also higher. In all three the proportion of fuel per ton of output was much higher, and the interest charges on investment, cost of maintenance and cost of labor, fell much more heavily on the ton of product than they do now. The possibilities of the direct process have not been able to keep pace with these changes. It has been shown that ultimately steel will be produced by the blast furnace and open-hearth steel furnace, operated together yet as individual units, in which the loss of material will be reduced to almost negligible proportions, the fuel will be but little more than the natural laws absolutely require, and power and manual labor will be reduced to the amount absolutely necessary for handling the material. The direct process cannot either practically or theoretically show anything better than this or as good.

But while the progress to the present time has been amply sufficient to put processes for the direct production of steel far in the background, much work remains to be done. But little is called for from the blast furnace itself. Its development has shown a steady onward march of which there are few similar instances in the whole catalogue of manufacturing industries. With the open-hearth furnace it has been different. The development has been by fits and starts, and we are probably even now on the threshold of sweeping changes. With the Besemer converter little has been done, outside the supplanting of the cupola by the mixer for direct metal and the increase in size of plant and reduction of labor cost, and very little more can be done.

It remains for the waste in coke making to be stopped, and likewise the waste of heat, both latent and sensible, from the blast furnace. The Bessemer converter may remain in the field for a long time, but it will not occupy larger proportions as that field increases. The possibilities are all with the open-hearth furnace, and the probabilities seem to lie in the direction of continuous operation—not for steel of the highest quality, but for ordinary commercial steel. Last year basic open-hearth steel constituted a fourth of our total steel production, and both kinds of open-hearth steel a third. In the last year of the present decade open-hearth steel bids fair to make three-fourths of the total, and it will be nearly all basic.

The record of the development of the open-hearth process is being confused by an influence acting in two opposing directions. The concentration of ownership of the bulk of the American iron and steel industry into one company affords the opportunity of spending vast sums of money on single units of production, while it has also tended to encourage the building of comparatively very small plants. On the one hand we have immense blast furnaces operated in groups, separated by large metal mixers from large open-hearth furnaces grouped into units, continually reducing costs by increased size and increased initial outlay per ton of product; and on the other we have small independent open-hearth furnaces operated singly or perhaps in pairs, and dependent on the open market for chilled pig iron, or in some cases making their own iron, but casting it in pigs. Nothing could be more remarkable in the development of any industry than such an antithesis.

## DECLINE IN IRON EXPORTS MORE PRONOUNCED.

The iron and steel export statement emphasizes more strongly each month the shrinkage in our foreign trade. In the forms of material represented in our monthly table the Treasury Department statement for August showed a falling off of 80,000 tons from that of Au-

than for the corresponding month in 1900, and the October total which is shown below indicates a falling off of 118,000 tons. Particularly noticeable is the decline in pig iron and billets, while the rail shipments of October, 1900, are cut in two. The table follows:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES.

| | GROSS TONS. October. | | 10 Mos. end'g Oct. | |
|---|---|---|---|---|
| | 1900. | 1901. | 1900. | 1901. |
| Pig Iron | 65,182 | 8,798 | 227,596 | 57,754 |
| Scrap | 6,289 | 1,880 | 43,277 | 12,552 |
| Bar Iron | 1,187 | 530 | 7,081 | 16,996 |
| Wire Rods | 2,308 | 1,621 | 7,473 | 6,009 |
| Steel Bars, (not Wire Rods) | 11,035 | 1,029 | 63,499 | 32,654 |
| Iron Rails | 29 | 89 | 5,314 | 901 |
| Steel Rails | 36,599 | 18,657 | 325,525 | 285,380 |
| Billets, Ingots and Blooms | 23,599 | 93 | 70,845 | 27,196 |
| Hoop Band and Scroll Iron | 665 | 172 | 1,984 | 1,187 |
| Iron Sheets and Plates | 661 | 300 | 7,393 | 3,981 |
| Steel Sheets and Plates | 5,619 | 812 | 32,530 | 22,120 |
| Tin Plates, Terne Plates and Taggers Tin | 8 | 11 | 91 | 427 |
| Structural Material | 4,104 | 3,335 | 54,761 | 44,267 |
| Wire | 6,499 | 8,863 | 65,564 | 70,378 |
| Cut Nails | 622 | 332 | 9,144 | 8,361 |
| Wire Nails | 1,303 | 1,175 | 24,227 | 16,533 |
| Other Nails, incl'd'g Tacks | 150 | 178 | 1,569 | 1,575 |
| Total | 165,759 | 47,865 | 946,20 | 599,734 |

## LEGISLATION AND FOREIGN TRADE.

In a recent issue we published an interesting statement by Mr. S. H. Short, an American inventor, now operating in the electric street railway field in England It was in substance that the English company with which he is connected buys machinery and material tools, lumber and steel castings in this country and works them up into the manufactured article by American methods under the superintendence of engineers trained on this side of the Atlantic. It is said that better work is to be obtained from the workmen than is obtainable from American operatives, but it will require further testimony to render this statement convincing.

The suggestion opens up, however, a condition of affairs to which attention may be directed in view o the possibility that Congress at an early date may interfere with the trade adjustments in force between this country and others. It is beyond dispute that the business possibilities of the United States are such that Europe can be undersold in most branches of manufactured iron and steel as well as in agricultural products. There is indeed a likelihood that to a considerable extent trade will be driven out of neutral markets when the long-awaited increase in American vessels comes; and this economic conflict may even force European countries out of the competitive race within their own boundaries. The trade question is not a one-sided affair. It must be remembered that our sales abroad are dependent upon the ability of other countries to purchase from us, and this follows only upon a healthy productive condition of their own industries.

There is another contingency to be considered and that refers to the advent of cheaper materials in the European markets. The export of cheaper steel to Great Britain or Germany means the production of ships, locomotives and machinery at a much less cost than is the case at the present time, and consequently increasing ability of the foreigner to compete successfully with us in open markets. There are doubtless many inequalities in our tariff rates that will bear close scrutiny and some pruning may be done to advantage with perfect safety to the trade structure, but a general revision would not be wise. It is for the purpose of directing attention to the need of caution in legislation affecting foreign trade that we refer to the condition of which Mr. Short speaks with knowledge Trade adjustments are too complex for off-hand treatment by political parties, and a strong influence should be exerted toward a steadying of public sentiment upon this all-important subject.

There is a belief current among mechanical engineers and others who lay no claim to expert knowledge of these matters, that the trades unions in Great Britain have such a hold upon English workmen that the utilization of the best automatic machinery is impossible, the trade regulations precluding the possibility of the one man operating several machines. In point of fact there is a general recognition abroad that something must be done and done speedily if it is to have any efficacy in the turning of the tide from its strong movement toward the West. Statements like the one quoted from Mr. Short suggest such an appreciation of American methods and machines as to indicate a lessening of the old grip of trades unionism. At the recent Glasgow Congress papers were read in reference to the successful introduction of the premium plan and of various other measures only thoroughly successful where the interests of the employer and the employed are recognized as on parallel rather than on opposing lines. This does not mean that English manufacturers are in a position to regain the ground lost in recent years; nevertheless, they may with our assistance be better prepared to hold their own in the markets they now dominate, and it is unwise to make any changes which will add burdens or handicaps to any American manufacturer in the industrial race. No one supposes that the politicians would care to undertake radical changes, but a hasty move in the direction of tariff revision should be deprecated by all who have the future of the nation's industries at heart. R. I. C.

### Consolidation of Two "Independent" Companies.

(Special Telegram.)

PITTSBURG, Dec. 4.—The Pittsburg Steel Co., which is building a plant at Monessen has been reorganized and a consolidation with it of the Pittsburg Steel Hoop Co., having a plant at Glassport, Pa., effected. The capital stock of the company is $3,000,000. For each share of Pittsburg Steel Hoop Co. stock three shares in the new company were given. The hoop company was capitalized at $400,000. Wallace Rowe, formerly Pittsburg manager of the American Steel & Wire Co., has been elected president; Edward Bindley, vice-president; W. C. Reitz, treasurer, and C. E. Beeson, secretary.

Miller, Thornburgh & Co., incorporated under the laws of New York, with offices at 135 to 137 Broadway, New York City, will engage in the iron and steel business, making a specialty of wrought iron pipe, cold drawn seamless, lapweld steel and charcoal iron boiler tubes, rivets, etc. The above concern is composed of the following gentlemen: President, W. E. Miller, formerly president of Shelby Steel Tube Co.; vice-president and manager, L. B. Thornburgh, formerly assistant general sales agent of Shelby Steel Tube Co.; secretary, E. A. Miller, formerly New England representative of Shelby Steel Tube Co.; treasurer, A. A. Kaiser, formerly New York representative of Shelby Steel Tube Co.

Three mills of the Chester, W. Va., plant of American Tin Plate Co. in operation this week. The entire ten mills will be in operation by the first of the year.

## A NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.*

BY ERNEST W. NAYLOR, PHILADELPHIA, PA.

So far as sharp cut-off, expansion, exhaust, and compression were concerned, the early engines with hand-actuated valve gear were better than any engine with valve gear actuated by mechanical means at the present day; but the speed being limited by the endurance of man, necessity for continuous work and more speed brought into use mechanically actuated valves more or less perfect. High steam pressure made it necessary to compound the cylinders in order to get the most possible out of steam: but even with the vast improvements made in recent years, the engine is still limited in speed by its valve gear; expansion and compression are also limited in single cylinder engines to a considerable degree; and while we get increased economy by compounding, the extra cost of the engine is a serious item to many users, and they prefer to buy a cheaper engine and use more coal.

The writer has for many years made this question a special study and, in presenting this paper before the society, thinks he can show marked economy from the use of the valve gear here described, a gear whereby perfect expansion and compression can be obtained in simple engines using pressures up

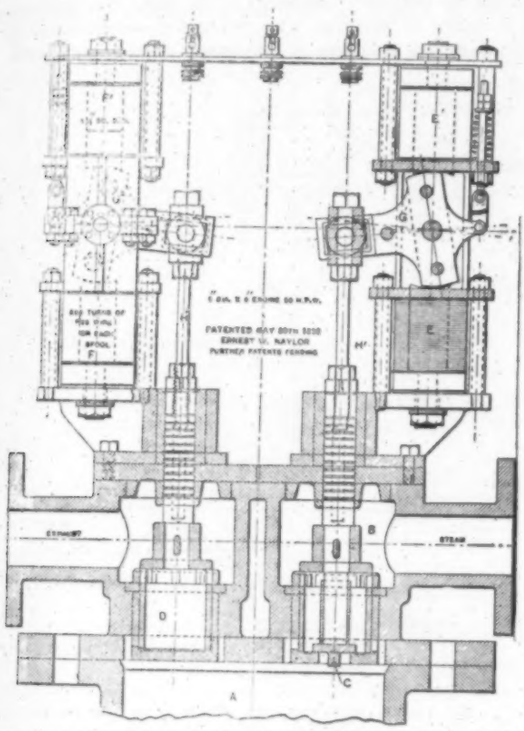

FIG. 1.—A NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

to 200 pounds per square inch, having a range of cut-off from 0 to 100 per cent of the stroke, and the same range in exhaust and compression, giving ability to stop or reverse from any part of the building or engine-room without shutting off steam. This gear will also admit steam many times during the same stroke, and ability to stop in a very short space of time without shock or jar is another advantage, while the speed is only limited by the possible piston speed.

The engine that has been under test for twelve months is small, but the results are certainly remarkable. It was calculated for a 5-horsepower, single-acting, 3-cylinder engine with 150 pounds per square-inch boiler pressure, and to run at 500 revolutions per minute, and has been run at varying pressures from 1 to 60 pounds per square inch; it was not possible to reach a higher pressure where the tests have been conducted; the engine has also been successfully run with compressed air.

The cylinders are 2½ inches in diameter by 4 inches stroke; the clearance is 1 per cent of the cylinder capacity. Poppet valves placed in the heads are used both for steam and exhaust, the maximum opening being 1-25 the area of the cylinder in each case. Table No. 1 gives a few results out of the many tests we have made. The engine has run thirty million revolutions up to the date of writing this paper (September, 1901), and not a single bushing has been taken up or valve refaced. There are no glands, so that no packing has been used, and no piston rings were used, the pistons being

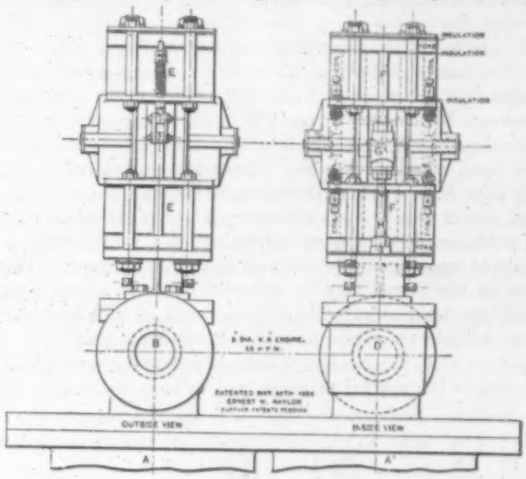

FIG 2.—A NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

very deep and grooved. The cylinders were well covered, but pipes, valve bodies, and boiler were uncovered; under these conditions the exhaust was very even when using a high rate of cut-off, as the table shows.

TABLE 1.

| No. of test | 1 | 5 | 20 | 28 | 50 | 60 | 60A |
|---|---|---|---|---|---|---|---|
| Load | None. | None. | None. | Non | 2 h. p. | 3 h. p. | None. |
| Lead | 1/8 | 2/8 | 2/8 | 2/8 | 3/8 | 3/ | 2/8 |
| Cut-off at per cent of stroke | 50 | 15 | 10 | 8 | 3 | 2 | Dead centre |
| Exhaust open at per cent of stroke | 85 | 83 | 85 | 92 | 85 | 80 | 85 |
| Exhaust closed at per cent of stroke | 50 | 20 | 15 | 20 | 15 | 10 | Dead centre |
| Area of steam valve opening | 1/125 | 1/125 | 1/125 | 1/125 | 1/125 | 1/125 | 1/125 |
| Area of exhaust valve opening | 1/60 | 1/60 | 1/60 | 1/60 | 1/60 | 1/60 | 1/60 |
| Steam pressure in lbs. per sq. inch | 1 | 5 | 20 | 28 | 20 | 70 | 70 |
| Revolutions per minute | 60 | 300 | 440 | 600 | 540 | 680 | 875 |

Figs. 1, 2, 3, 4, 5, and 6 show the gear as applied to two Westinghouse engines; one being 9 by 8 inches, and the other compound, 8 and 13 inches by 8 inches. These engines have not been tested at the date of writing, but the design being the result of tests on the engine used, it is thought better to use them as an illustration of the working of the gear. The lettering refers to the parts as follows:

*AA'* cylinders, *BB'* steam valves, *CC'* relief valves in steam,

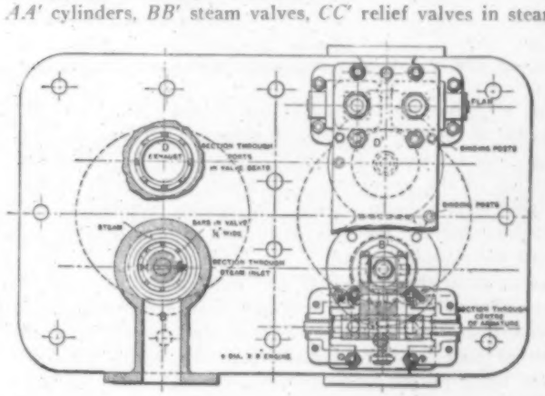

FIG. 3.—A NEW VALVE GEAR FOR GAS, STEAM AND AIR ENGINES.

valves, *DD'* exhaust valves, *EE'* electromagnets controlling steam valves, *FF'* electromagnets controlling exhaust valves, *G* to *G⁴* armatures and levers connected to valve spindles, the travel of which is adjustable for a range from 0 to maximum by bolts and nuts *H* to *H⁴*.

*I* and *J* are contact disc controllers, which control the time of opening of the steam and exhaust valves and the point of

* Read at the New York meeting of the American Society of Mechanical Engineers, Dec. 2-6, 1901.

stroke of the piston at which the valves are closed, or, in other words, the lap, the lead, exhaust opening and closing, expansion and compression.

*KK'* are adjustable levers carrying brushes, or contact points, to make electrical connection between the sickle-shaped contact plates and the magnets controlling the steam valves; *LL'* are levers for exhaust valves similar in all respects to *KK'*.

*MM'* are lever arms carrying the contact levers *KK'* and *LL'*. The bosses or hubs of these levers are extended up to the bracket *N*, which carries all of the adjustments and contact levers. The contact levers *KK'* and *LL'* can be placed in any position in relation to the position of the cranks by turning the hand wheels *OO'* which actuate the worms and worm wheels *P* to $P^3$, the wheels being keyed to the hubs of *MM'*, so that either positive or negative lead may be given the steam valves while the engine is running; in a similar manner the time of opening of the exhaust valves in relation to the position of the piston may be adjusted. The adjusting nuts $Q^1$ to $Q^4$ are used to vary the relative leads of high and low pressure cylinders and the points of exhaust opening.

The discs *RR'* are merely to carry the binding screws for the wiring to the several magnets, and to keep electrical con-

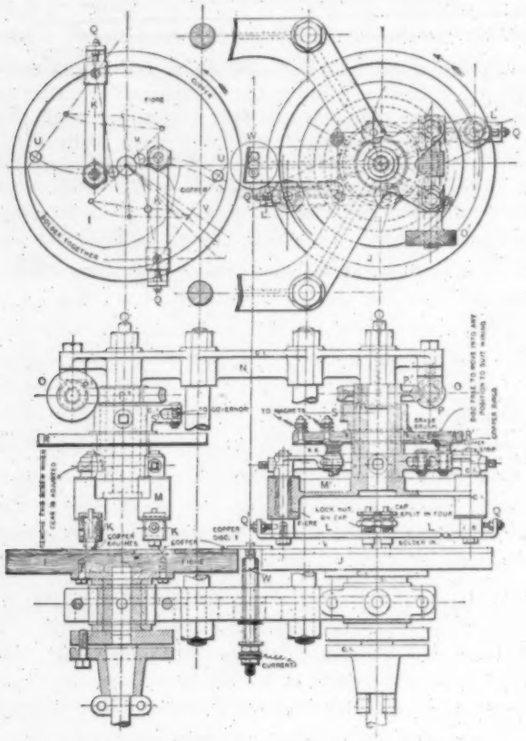

FIG. 4.—A NEW VALVE GEAR FOR GAS, STEAM, AND AIR ENGINES.

nection whenever the levers *MM'* are turned. The levers *SS'* are keyed to the sleeves *ss'*, which connect by links and levers to the contact levers *KK'* and *LL'*, the levers *SS'* being also connected to the governors *TT'*, which respectively control the steam and exhaust valves. In marine, automobile, and locomotive engines the governors are dispensed with and starting levers used instead.

The range of the levers *KK'* and *LL'* being *u* to *U*, it will be seen that valves may be held open from 0 to 100 per cent of the stroke or to any intermediate position, according to the length of time contact is made with the plates *VV'*, the current being passed to these plates through the connection *W*, which is connected to one electrode, the other ends of the magnet coils all being connected to the other electrode, as shown in Fig. 6. From the above it will be seen that the valves may instantly open and close, and steam be given many times during the same stroke.

All eccentrics, rods, levers, links, and other usual valve gear being done away with, the new valves and valve gear are placed on the heads, so that erection is easy. Clearance can be gotten down to one-tenth of 1 per cent in large cylinders, being only 1 per cent in a 2½ by 4-inch cylinder, as previously mentioned; therefore compression up to initial pressure is easily obtained without any appreciable loss of efficiency. The valve gear may be placed in any position most suitable to the design of the engine, regardless of the position of the crank shaft; the friction of the gear is a negligible quantity, and adjustments may be made while the engine is running. During the tests, a piece of newspaper placed between the armature and poles of the magnets (reciprocating magnets were used in this test) made a difference of from 75 to 100 revolutions per minute.

The valves are all ½-inch diameter, and, as shown in the table, the lifts were for the steam valve 2-100 of an inch, and for the exhaust valves 4-100. The exhaust could not be heard two yards away, and had not enough energy to blow the ash off a cigar. Cylinder condensation was practically *nil*. No particular care was taken in the manufacture of the engine; but if properly adjusted for the load, it was possible to make it "run away" though the load was suddenly taken off, when running at full speed and without the use of a governor. The larger the engine, the smaller the relative cost and size of the gear, the drawings here shown being amply large for one of 500-horsepower. There was no vibration; when a glass of water was placed on the cylinder head and the engine stopped at once, not the slightest disturbance of the water was evident.

It will readily be seen that, when using compressed air as a driving power, the economy is very much greater than with

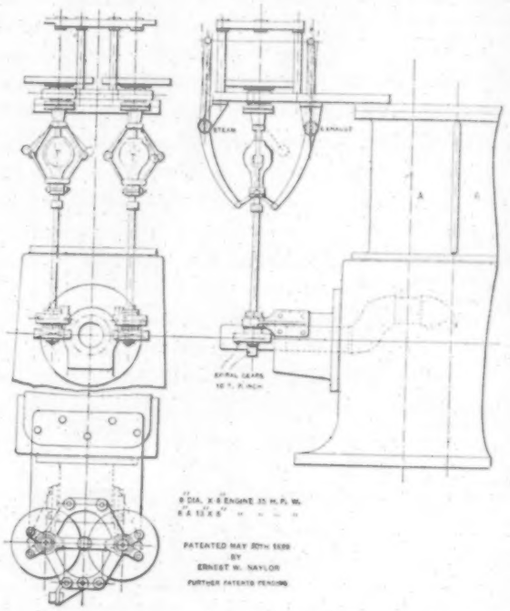

FIG. 5.—A NEW VALVE GEAR FOR GAS, STEAM, AND AIR ENGINES.

any other valve gear; and it is possible, when motors are to be used in various scattered buildings, that air can be used much more economically than steam, owing to the absence of condensation in transmission and the high rate of expansion obtainable.

In the case of gas engines, the best burning or explosive mixture is readily obtainable, as the proportion of air to gas can be at once adjusted; likewise the cut-off is adjustable, therefore any amount of mixture can be admitted to the cylinders, thus making regulation easy of accomplishment; the exhaust is also adjustable from 0 to 100 per cent.

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At the regular monthly meeting of the Foundrymen's Association at the Manufacturers' Club, Philadelphia, Wednesday evening, Dec. 4, the principal paper was by J. G. Sadlier of the Springfield Foundry Co., Springfield, O., on "Combustion, and Its Effect on the Structure of Both Fuel and Metal."

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The Browning Engineering Co., of Cleveland, has the contract to build the slag handling equipment for the Ohio Iron & Steel Co., Lowellville, O., referred to in our last issue.

## CINCINNATI MACHINERY MARKET.

The foreign machinery trade does not show much encouragement, but domestic business keeps up remarkably well. Some of the large machine tool builders report that the easing up in orders that is generally met with toward the end of the year is felt to a degree, but not to the usual extent. A great many concerns have put off a portion of the business that they will have to give the machine tool man before long on the theory that it will come in just as well after the first of the year. Nearly all concerns are short on tools of certain descriptions, there being only a few types on which delivery can be expected under three months. Building is going ahead on several large new concerns while many of the old ones are making important extensions and additions to floor space.

The Cincinnati Punch & Shear Co. recently finished the largest punching machine it has ever turned out, and there was a good deal of difficulty in getting it to the railroad. It was built for the American Frog & Switch Co., a new concern started by Cincinnati capital at Hamilton, O. The machine weighed 23 tons and unusual methods were employed in getting it to the C. H. & D. depot, it being impossible to take it across any canal bridge.

The formal record was made this week of the 99 years' lease to the Lodge & Shipley Machine Tool Co. from E. B. Stanley. Co. to buy the control of the company from the Cincinnati holders and move the plant to one of the smaller Indiana towns. This plant is the forerunner of about half the important machine tool concerns in Cincinnati and its removal has been attempted on more than one occasion.

The failure of the Berlin concern of Gustav Diechmann & Sons is another indication to Cincinnati machine tool builders that the conditions in the German trade are by no means good. This concern was considered one of the most conservative in the business abroad and for a long time handled tools made in Cincinnati, being one of the pioneers in handling American-made tools and taking the first line that was sent out by the American Tool Works Co. when Charles Davis was pushing the foreign trade.

The American Laundry Machinery Co., that was burned out about a month ago, has secured temporary quarters, but has not as yet decided upon a site for the new plant, which will be the largest for turning out laundry machinery in the country.

The Cincinnati Planer Co. reports that its business has held right up in spite of the fact that many buyers want to put off laying out money for new equipment until after the first of the year.

The Newport Rolling Mill Co. contemplates building a $200,000 steel plant to supply steel to its sheet and plate

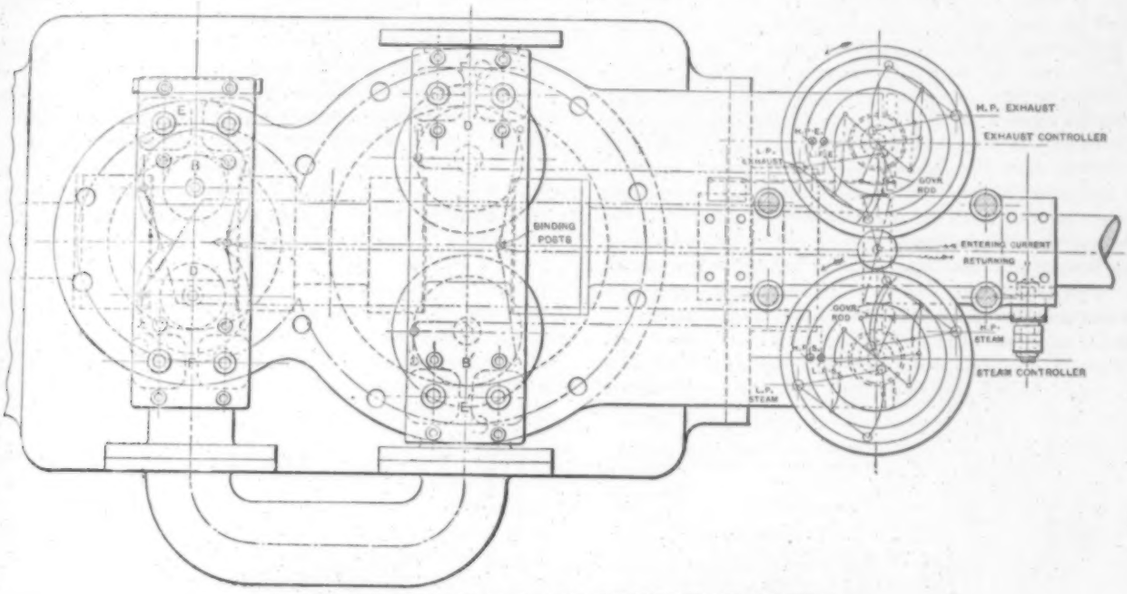


FIG. 6.—A NEW VALVE GEAR FOR GAS, STEAM, AND AIR ENGINES.

This gives the company a strip 1,000 feet long from Colerain Ave. clear through to Spring Grove Ave. Contracts will be let in about a week for an additional building that will give 10,000 additional square feet of floor space. The additional floor space will be used for erecting purposes, the present quarters being already so crowded with machinery as to infringe on the space that has been needed for erecting large lathes. The company reports a very good business and says that machine tool men ought certainly as an entire class to be making money this year. "We are as busy as we can be and are making the addition to our space so that we can attend to our business more promptly and advantageously."

The Cincinnati Gas & Electric Co. is compelled to double the size and capacity of its Plum St. generating station. The company will be in the market for a large amount of equipment including a 3,000-h. p. and other generators, engines and boilers. Vice-President Norman G. Kenan and Manager W. F. White of the electrical department, have just returned from a trip through the East, to look at engines and generators at the large establishments.

The Tudor Boiler Mfg. Co. has taken a contract for two 250-h. p. Lynn vertical boilers for the Race street power plant of T. J. & J. J. Emery. This concern will build an addition to its present plant on ground space 40 by 200 feet.

Negotiations are on once more between J. B. Doan, of Chicago, and the majority interests in the American Tool Works and other finishing mills. This company has refused an offer to remove to another point.

The Bullock Electric Mfg. Co. has been spoken of in connection with other of the electric manufacturing concerns outside of the Westinghouse and General Electric as about to be formed into a combination. So far as can be learned the matter has gone no farther than the formulation of a general plan. The Cincinnati concern is going ahead with extensive improvements. The plant at Norwood is running day and night and the extension to be made to the factory will practically increase its capacity 50 per cent.

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Geo. G. Blackwell, Sons & Co., Ltd., of Liverpool, Eng., whose chairman, Geo. G. Blackwell, is now in this country, announce that they have arranged with the Harbison-Walker Co., Park Bldg., Pittsburg, to take the sole sale for the United States and Canada of their special furnace lining chrome ore. For upwards of 20 years the Liverpool company has sold this ore to the trade, particularly for use in basic open-hearth furnaces. The special combination in this ore of chromium, magnesia, alumina and silica has made a large demand for it in this country. In Europe the Blackwell company supplies every furnace. The Harbison-Walker Co. has used over 2,000 tons of Blackwell ores in the past year. The Blackwell company announces that it will continue to sell from Liverpool its Lion brand alloys for use in steel manufacture, making such visits to the United States and Canada as the trade demands.

## A NEW METHOD OF ROLLING SHEET METAL.

This invention relates to a method of rolling sheet metal and its object is to provide a method of rolling which will do away with much of the reheating employed in the usual processes and also reduce by considerable the manipulations and handling common to the regular process. It is the general practice in rolling sheet metal to reduce the billet to bars about five-eighths to three-quarters of an inch thick and five to eight inches wide, which are then cut into sheet bars of a length approximately equal to the width of the sheets to be formed. The sheet bars are then heated and fed between suitable breaking down rolls. In order to save time it is the custom to work two of these bars together. The bars are thus reduced from one-quarter to one-eighth of an inch in thickness, and the two sheets are then placed one on the other and rolled down to about 18 or 20 gauge. The sheets are then separated and a pile consisting of two or more sheets placed one upon the other is formed and heated to a good rolling temperature and then reduced by rolling in suitable rolls. This is generally sufficient for the coarser gauges of sheet iron, and the packs can at once be sheared, opened, cold-rolled and annealed. But for the finer gauges the pack is usually doubled over on itself, making a pile of six or eight sheets, again heated and rolled until reduced to the desired gauge, after which the packs are sheared, opened up, cold-rolled and annealed. All the operations described—such as roughing down the bars, piling the sheets, folding the packs and charging the material at different stages into furnaces—are performed by hand and the method involves therefore a great expenditure of time and labor.

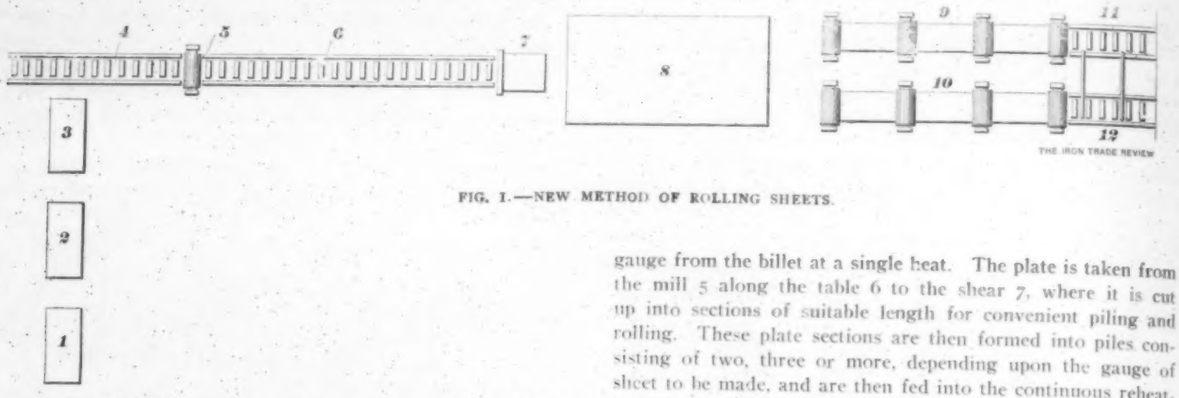



FIG. 1.—NEW METHOD OF ROLLING SHEETS.

The present invention has the object of simplifying the process and reducing the cost of labor incidental to the reduction of the metal to the desired gauge. The method consists briefly in reducing a billet or slab at a single heat into a plate of a width, approximately equal to the width desired in the finished sheet and from one-eighth to one-fourth of an inch thick, then shearing this plate into sections of suitable length, placing two or more of the plates on each other and charging them into a reheating furnace, where they are raised to a good rolling temperature, and then introducing two or more piles of packs simultaneously into parallel continuous mills where they are reduced still further, and at the same heat piling the reduced packs one on the other. The double packs are then rolled until the sheets are reduced to the finished gauge, after which the packs are sheared, opened up, cold rolled and annealed in the ordinary way.

The cuts show the general plan of the mill. Fig. 1 is a plan of the first part of the machinery and Fig. 2 a similar view of the continuation of the apparatus. The heating furnaces are indicated by 1, 2 and 3. Here the billets are first heated, being then transferred to the feed-table 4 of the rolling mill 5. The latter is either a two-high reversing mill or a three-high mill, the three-high mill being preferred, provided with a feed-table 6 on the rear side. The heated billet is passed back and forth through the mill 5 in the well understood manner until it is reduced to a plate equal in width to the finished sheets and from one-eighth to one-quarter of an inch thick, depending upon the gauge to which the sheet is to be finished; this estimation being based upon the rolling of the required gauge from the billet at a single heat. The plate is taken from the mill 5 along the table 6 to the shear 7, where it is cut up into sections of suitable length for convenient piling and rolling. These plate sections are then formed into piles consisting of two, three or more, depending upon the gauge of sheet to be made, and are then fed into the continuous reheating furnace 8. The packs are heated to the appropriate temperature and then two or more are entered simultaneously into parallel continuous or tandem mills. The cuts show two such mills, 9 and 10. Each comprises four stands of rolls with suitable guides, but either more or less than four stands of rolls may be used if this is desirable.

The reduced packs pass to the feed-tables 11 and 12 and the pack upon the table 12 is transferred to the table 11 and placed upon the pack there.

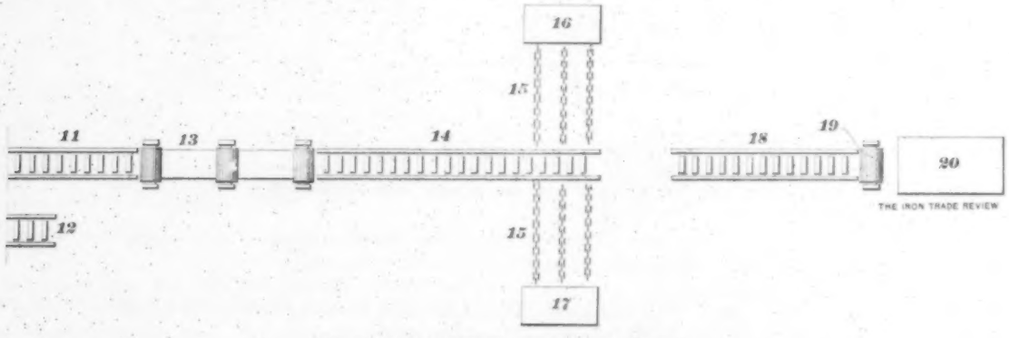



FIG. 2.—NEW METHOD OF ROLLING SHEETS.

When the packs leave the mills they have been reduced to as thin a gauge as is possible owing to the spring of the rolls and the slack in the adjusting means of the last stand of rolls in the mill, and a further rolling of the packs singly would not result in any material reduction of the thickness under these conditions. Consequently the reduced packs are assembled one on top of the other and being at a working temperature are passed through the continuous or tandem mill 13. This comprises two or more stands of rolls (three being shown in the diagram). In this mill the double packs are further reduced and the spring in the rolls and the slack in the adjusting means of the last stand will not be so great as to prevent the double packs being brought to the desired thickness. They are then conveyed by live rollers 14 and endless chains 15 to the shears 16 and 17 where they are sheared up to size. After being opened up they are conveyed by the live rollers 18 to the cold rolls 19, through which the sheets are again passed to smooth down and finish the surface. The sheets as they pass these rolls are again piled on the bottom plate of an annealing

box, conveyed by a crane to the annealing furnace 20 and subjected to the ordinary annealing treatment.

According to this method of rolling sheet metal the material is heated twice only, first in the shape of a billet in the furnaces 1, 2 and 3 and then in the reheating furnace 8. The operations after that reheating are performed with such expedition as to reduce the sheets to their finished gauge at the single heat. In the old methods of rolling sheet metal three and sometimes four or more heats are necessary from the ingot or billet to the finished sheet. The number of workmen required in the new plan of operations is much less and the product correspondingly cheapened. If the initial packs from the furnace 8 were formed of four, six or eight sheets instead of two they would not be as readily reduced in the mills 9 and 10, and, furthermore, there would be more liability of the sheets slipping one on the other when entered in the mill, due to the thickness of the packs. If such packs were rolled in a continuous mill in succession and not simultaneously, the first pack through that mill would have to be delayed until another one or more arrived in order that they could be assembled to form a pack of sufficient thickness to be further reduced in the next mill or set of rolls. This delay would allow the first pack to cool to such an extent that it would not readily reduce in the next mill; but by entering two or more packs simultaneously in parallel mills each of the packs may be formed of a small number of sheets, so that they will readily reduce and leave the mills at a good rolling heat.

In the case of the coarser gauges it may not be necessary to pile the packs as they emerge from the parallel continuous mills 9 and 10, in which event the packs would be passed in succession through the mill 13, and the mill 10 could be dispensed with.

The inventors of this process, Joseph W. Keffer and Charles B. Cushwa of Pittsburg, estimate that sheets can be manufactured by their method from $5 to $8 per ton cheaper than the old methods.

## BRITISH IRON MARKET QUIETER.

There is a rather quieter tone in the iron and steel trades, taking the position all through. This is more perceptible in the pig iron than in the finished material branch, although in the latter the demand is not quite so pressing as it was. Business in pig iron has shown some contraction during the past week, and consumers exhibit more disposition to hold off for easier prices, although producers are already declaring that their profits have almost reached vanishing point, what with the decline in the price of iron and the dearness of coke. Some districts are doing better than others, however, and the quieter tone is not so noticeable in these. In the manufactured branches of the trade the demand is still keeping up fairly well, and some works are very busy, but on the whole there appears to be rather less new business coming forward. In the shipbuilding trade there are not many new contracts offering. The depression in the freight market is all against shipbuilders at present, but they are actively employed, and what with the work in hand at the beginning of the year, and the amount booked during the first six months of it, their total output for this year promises to establish a record, as the tonnage launched during the past ten months has done.

Pig Iron.—There is undoubtedly a quieter feeling in the pig-iron market. The reports to hand from Glasgow, Middlesbrough, and Manchester are all of a less favorable nature. In the Cleveland district the quotation for No. 3 has fallen to 44s., while the other qualities have also suffered a slight reduction and business is rather slower. In Lancashire, too, only a hand-to-mouth trade is doing, and the position is less satisfactory. The South Staffordshire market is firmly maintained, however, and a brisk business is doing, makers being hardly able to cope with the demand. Hematite is in good request and prices are unaltered. The following is a statement of the stocks of pig iron in public stores:

| | Tons. |
|---|---|
| Connal's at Glasgow | 56,700 |
| Connal's at Middlesbrough | 135,500 |
| Railway Stores, Middlesbrough | 1,700 |
| Connal's at Middlesbrough, hematite | 300 |
| Cumberland and Barrow Stores | 11,300 |

In Middlesbrough stocks of pig iron have decreased during the week ended Nov. 12, by 1,494 tons, while the Barrow and Glasgow figures also exhibit a decrease of 70 and 292 tons respectively. So far this year the stocks in Middlesbrough have increased about 53,800 tons, while at Glasgow and Barrow there have been decreases of 14,550 and 11,270 tons respectively. On the week the total decrease in stocks throughout the country is 1,856 tons; on the year the increase is 53,858 tons.

Manufactured Iron and Steel.—In manufactured iron and steel there is a moderate business passing, and prices are for the most part well maintained, although the demand shows symptoms of slacking off rather than of increasing. At the same time, makers generally are by no means short of work at present, most of them having sufficient on hand to keep their works fully going; while some, relying on the contracts on hand and the business in sight, look to maintain this activity throughout the winter. Orders are not being given out quite so freely in some districts, however, and consumers are endeavoring to enter upon renewals at easier rates. But there is no quotable change in the general level of prices. Lancashire bars remain at the £6 10s. basis; while in South Staffordshire, where a good business is being done in this class of iron, branded bars are still at £8 10s., and common at £7.

Foreign.—In regard to the Continent the demand for finished iron in France is sufficiently regular to keep the mills and forges in fairly steady employment. There is no perceptible improvement in the finished iron trade in Belgium, which is able to make very little headway against the competition of German producers, and in the case of girders there are very few home firms who can hope to secure business under the same conditions as their foreign competitors. The rolled iron trade in Germany continues without movement as far as concerns the home demand, and producers are selling iron for export at a loss in the hope of recouping themselves by higher prices at home.

Comparison of Prices.—The annexed table shows the current prices compared with those of last week, and of the corresponding period last year:

| | Nov. 14, 1901. | Nov. 7, 1901. | Nov. 15, 1900. |
|---|---|---|---|
| IRON ORE— | s. d. | s. d. | s. d. |
| Rubio, Middlesbrough | 15 9 | 15 9 | 20 0 |
| " Cardiff | 14 3 | 14 3 | 17 9 |
| Pottery Mine, North Staffordshire | 20 6 | 20 6 | 20 6 |
| Hematite, West Coast (at mines) | 16 6 | 16 6 | 19 6 |
| PIG-IRON— | | | |
| No. 3 foundry, Middlesbrough | 44 0 | 44 3 | 65 0 |
| Warrants, | 43 4 | 40 0 | *64 6 |
| Scotch warrants, Glasgow | 54 6 | 54 11½ | 68 9 |
| Hematite warrants, West Coast | 58 8 | 59 3½ | 79 0 |
| Cold blast (foundry), South Staffs | 103 0 | 103 0 | 130 0 |
| Welsh hematite, Cardiff | 60 0 | 60 0 | 80 0 |
| MANUFACTURED IRON & STEEL— | £ s. d. | £ s. d. | £ s. d. |
| Marked bars, South Staffordshire | 8 10 0 | 8 10 0 | 10 10 0 |
| Common bars " | 7 0 0 | 7 0 0 | 8 15 0 |
| Steel rails, Middlesbrough | 5 10 0 | 5 10 0 | 6 12 6 |
| " West Coast | 5 5 0 | 5 5 0 | 6 5 0 |
| " Cardiff | 5 0 0 | 5 0 0 | 6 7 6 |
| Steel angles (eng.), Middlesbrough | 6 2 6 | 6 2 6 | 7 7 6 |
| " " Glasgow | 5 12 6 | 5 12 6 | 7 5 0 |
| Steel plates (ship), Middlesbrough | 6 2 6 | 6 2 6 | 7 9 0 |
| " " Glasgow | 6 2 6 | 6 5 0 | 7 0 0 |
| " (boiler) Glasgow | 6 10 0 | 6 15 0 | ..... |
| Tinplates, Bessemer I. C. cokes, South Wales | s. d. 14 0 | s. d. 14 3 | s. d. 13 6 |

*One month sellers.

—[London Iron and Coal Trades Review, November 15, 1901.

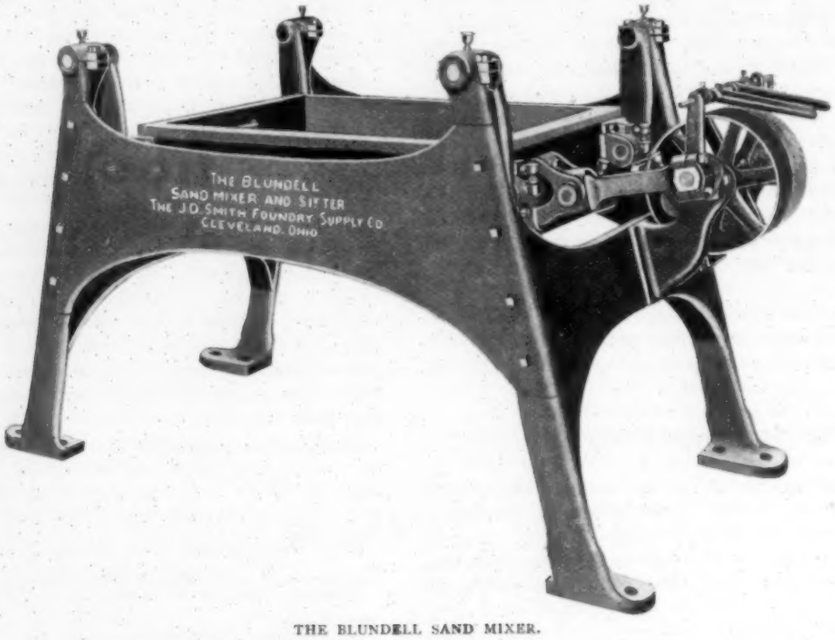
H. W. White, mechanical engineer of the Enterprise Boiler Co., Youngstown, O., has disposed of all patents held by him on gasoline engines and lathe turning tools to Pittsburg parties. It is stated that a company will be organized in the near future to manufacture under these patents.

The tonnage of orders now on the books of the Cleveland Steel Co. is equal to the capacity for some two months ahead and the demand for sheets is just as strong as for some months past. The company in reviewing the business in light plates for the current month has found that more orders have been entered than in the same length of time for many months. The brisk demand for both light plates and sheets is almost unprecedented for this season of the year and there is every indication of an exceptional business during the winter months.

## THE BLUNDELL SAND MIXER.

A sand mixer designed by F. Blundell, superintendent of the Taylor & Boggis Foundry Co. of Cleveland, and manufactured by the J. D. Smith Foundry Supply Co. of the same city, is shown below. It is claimed that while many sand sifters of various designs have been built, none have really performed their duty as sand mixers. In the Blundell machine the riddle box is held in position by a flange entirely surrounding it, which overhangs the riddle box frame and is prevented from any lateral movement by strong pins on side of riddle box which engage in a slide fastened to the inside of riddle box frame. A reciprocating motion is imparted to the riddle box by means of a crank and connecting rod which give a travel of three inches and develops a backward and forward motion describing the arc of a circle. It is claimed that this peculiar motion permits the machine to mix the sand much better than can be done by any other method.

The machine is built low enough to insure easy shoveling, yet so arranged that its lowest part is high enough to admit a wheelbarrow underneath. Every point liable to wear is babbitted and capable of adjustment, thus insuring a long life in the machine.




THE BLUNDELL SAND MIXER.

## Pittsburg Foundrymen's Association.

The regular monthly meeting of the Pittsburg Foundrymen's Association was held Monday evening, Dec. 2. After the presentation of a report from Dr. R. G. Moldenke, secretary of the American Foundrymen's Association, on "Melting Loss in the Cupola Process," Mr. H. M. Baldwin, of the Power Specialty Co., New York, spoke of the merits of the Bryan vacuum molding machine One of the machines was on exhibition and its workings were shown. Immediately after adjournment the foundrymen and their friends partook of a lunch provided by the S. Obermayer Co., of Cincinnati, who have recently opened a Pittsburg depot for all kinds of foundry supplies.

The foundry of the new plant of the Youngstown Iron Sheet & Tube Co., Youngstown, O., was placed in operation this week.

Melville Sawyer, for many years secretary of the Missouri Car & Foundry Co. at St. Louis, died last week at Nashua, N. H., aged 69. He was connected with the Missouri Ca. & Foundry Co. over 30 years.

## RECEIVER FOR HARTMAN MFG. CO.

The Union Trust Co. of Pittsburg was appointed last week receiver of the Hartman Mfg. Co., of New Castle, Pa. The application for the receiver was filed by one of the company's creditors, Stuart H. Patterson, of Plainfield, N. J. According to the statement of F. A. Umsted, president of the company, the value of the plant is $1,800,000, while the indebtedness, chiefly to Eastern creditors is between $500,000 and $600,000. Last spring the present company purchased the plant of the Hartman Mfg. Co., of Ellwood City, Pa. Almost immediately thereafter the abandoned plant of the Shelby Steel Tube Co., at New Castle, Pa., was purchased and the machinery removed from the Ellwood City plant. Thousands of dollars worth of new machinery was purchased and the company went heavily into debt. Only recently the plant of the Cuyahoga Steel & Wire Co., Cuyahoga Falls, O., was purchased by the company, but it is hardly probable that this plant will be affected by the receivership proceedings. Present indications point to an adjustment of affairs, the reorganization of the company on a firmer basis and the discharge of the receiver at an early date.

(Special Telegram.)

PITTSBURG, Dec. 4.—It is now extremely doubtful whether operations will be continued at the plant of the Hartman Mfg. Co., of New Castle, Pa., after the present orders are worked up. Some of the creditors are in favor of dismantling the plant and in that event capitalists of Ellwood City, Pa., where the plant was formerly located, are ready to purchase it again and remove the machinery to their town. Thus far the Cuyahoga Steel & Wire Co. of Cuyahoga Falls, O., has not been mixed up in the receivership, although the creditors are making efforts in this direction. The latter company was capitalized at $500,000. The Hartman Mfg. Co. had arranged to pay $125,000 in cash on the Cuyahoga Falls plant, but the bank through which the transaction was to have been completed has not yet delivered the papers to the prospective purchasers. The transfer, therefore, is not complete and for this reason it is doubtful if the court will include this plant in the receivership proceedings. The expectation is that it will revert to its original owners.

Follansbee Bros., Pittsburg, dealers in black sheets, tin and terne plates, roofing material, etc., will erect a warehouse at Second, Third and Short Sts., Pittsburg. It will be 120x160 feet and three stories. The cost is estimated at $80,000. This concern is also contemplating the erection of a sheet and tin plate plant.

## PERSONAL.

By a report on the estate of the late H. M. Curry, of the Carnegie Steel Co., of Pittsburg, there remains a balance for distribution among his heirs amounting to $6,115,117.54.

J. R. Phillips, district manager of the American Tin Plate Co., dined the superintendent and managers of all the plants in the Pittsburg district at the Hotel Lincoln, Pittsburg, on Saturday night, Nov. 30. Mr. Phillips acted as toastmaster. Among those present were Chief Engineer C. W. Bray and his assistant, W. A. Harris; E. T. Weir, D. M. Weir, James Hunter, John Marshall and T. M. Williams, from the Monongahela plant, Pittsburg; A. E. Piper, J. J. Griffiths, T. R. Walters and Thomas Evans from the Star plant, Pittsburg; G. C Stone, S. J. McCabe, H. J. Scanlon, from the Pittsburg plant, New Kensington, Pa.; W. H. Richards, R. C. Blean and Edward White from the Pennsylvania plant, New Kensington, Pa.; J. E. Lauck, W. L. Mussler, George Crawford, D. Pitcock and W. Lloyd, from the United States plant, McKeesport, Pa.; O. H. Burghan, J. M. Cecil and W. Howells, from the Hambert plant, Connellsville, Pa., and H. Osterberg and J. Phillips, from the Cumberland plant, at Cumberland, Md.

Frank Ryman has resigned as superintendent of the Oliver Iron & Steel Co., Pittsburg, Pa., and has been elected president of the New Castle Forge & Bolt Co., of New Castle, Pa.

Judge E. H. Gary, of the United States Steel Corporation, has given to Wheaton, a suburb of Chicago, one of the finest Methodist Episcopal memorial churches in the country. It was erected in honor of his parents, Erastus and Susanna V. Gary.

Nevin McConnell, who recently resigned as general superintendent of the Sharon Steel Co., Sharon, Pa., has been appointed general superintendent of the Union Steel Co., at Donora, Pa.

W. H. Baldwin, formerly secretary of the National Steel Co., is in Europe and will spend a considerable portion of 1902 abroad.

A Somerville, N. J., dispatch refers to a recent visit of A. R. Peacock, formerly vice-president of the Carnegie Steel Co., Ltd., to that place, and of his purchase of a residence apiece for two old friends, one an invalid and the other past hard work.

A. J. Moxham, general manager of the Dominion Iron & Steel Co., of Sydney, Cape Breton, is visiting a number of steel plants in the Central West, in company with James Ross, J. Daggan, John Ross and C. Shields, who are connected with Canadian industries.

Middlesbrough's engineers and metallurgists appear to be giving a large amount of attention to the improvement of their plants and resources. A number of them have already visited the United States, and made more or less elaborate reports on what they have seen there. Among others Mr. Charles Bell, son of Sir Lowthian Bell, has not only made a tour of the principal American works, but has written, printed and privately circulated an interesting little brochure on the subject. At the present time, the Middlesbrough ironmasters touring in the States include Mr. Charles Dorman, of the firm of Dorman, Long & Co., and of the Wire Works, near Mewport; Mr. Wrightson, of Head, Wrightson & Co. (eldest son of Sir Thomas Wrightson, M. P.); and Sir Christopher Furness, M. P., of the Weardale Coal & Iron Co., and Furness, Withy & Co.—[London Iron and Coal Trades Review, Nov. 22.

Nicholas Mager, late superintendent of the steel and grey iron foundry department of the A. & P. Roberts Co., Pencoyd, Pa., has taken a similar position with the Bethlehem Steel Co., South Bethlehem, Pa.

Henry A. Barren, master mechanic for the Cleveland Rolling Mill Co. and later for the American Steel & Wire Co., has been appointed superintendent of the Newburg mills of the latter company.

It can be stated that there is no truth in the report that C. Henry Hutchins of Worcester, Mass., president of the Crompton & Knowles Loom Works of that city and also of the United States Envelope Co., is to be president of the Pacific Iron & Steel Co.

Edward E. Slick, chief of the draughting department of the Edgar Thomson plant of the Carnegie Steel Co., for the past six years, has been appointed chief engineer of the American Steel Hoop Co. Upon his retirement from the Edgar Thomson plant he was presented with a gold watch by the employes.

W. H. Lewis, general manager of the Shenango mill of the National Steel Co., New Castle, Pa., resigned last week.

### The Minnesota Ore Rate Decision.

Following is the text of the recent order by the Minnesota railroad commission in the ore rate case brought against the Duluth & Iron Range and Duluth, Missabe & Northern roads:

"In the matter of filing of the tariffs of the Duluth & Iron Range Railroad Co. with the railroad and warehouse commission.

"To the Duluth & Iron Range Railroad Co.: It appearing to the commission that all ore shipped over said road from the mines or stations along its line of railway, within the state, to points without the state of Minnesota, is interstate commerce, and as to the tariffs the commission claims no jurisdiction, but as to all shipments of ore, from the mines or stations along the line of said road within the state to the ore docks at Two Harbors, destined to points within the state, is not interstate traffic, and over such shipments the commission claims jurisdiction.

"Therefore it is hereby ordered by the railroad and warehouse commissioners that the said the Duluth & Iron Range Railroad Co., on or before Dec. 3, 1901, file in the office of the commission at St. Paul, Minn., a schedule of its ore tariffs and charges for the transportation of iron ore not interstate traffic from the several stations and mines along its line of road to its docks on Lake Superior, at Two Harbors, Minnesota. And also keep said schedule for public inspection in every depot and station on the line of its said railroad.

"The orders of the commission of Nov. 9, 1900, and May 28, 1901, are hereby vacated. This same order applies to the Duluth, Missabe & Northern road also.

The following dissenting opinion was filed by Commissioner Mills:

"I agree with my brother commissioners as to so much of the order made herein as dismisses the orders of Nov. 9, 1900, and May 28, 1901, but I dissent from that part of the order requiring the railroad companies to file the tariffs, for the reasons expressed in the foregoing opinions. If the conditions should change so that shipments through the docks are, or practically can become, state shipments, it will then be time to require the filing of tariffs."

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With its issue of Dec. 12 the *Marine Review* will print in three issues a biography of Hon. Peter White, of Marquette, Mich., making the story of his life and experiences the framework of a detailed account of the iron mining development in the Lake Superior region. Peter White was identified with the Marquette district when the first iron mine was opened and he is one of the Upper Peninsula's most prominent citizens today, as he has been for years. The narrative the *Marine Review* is to bring out will gather up much of the romance of this picturesque and industrially historic region.

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The Donora Mining Co. of Pittsburg, affiliated with the Union Steel Co., whose large plant is located at Donora, Pa., has made some valuable finds of high grade ore, amounting to several million tons on the Mesabi range. They are located in section 28, township No. 59 and range 15. The ore is of excellent physical structure and analyzes 62 to 63 per cent iron and from .03 to .035 per cent phosphorus. Exploration has been under way for several months. Operations will probably be commenced immediately so that shipments of ore can be made in the spring upon the opening of the navigation season. Ground was broken this week for the erection of the plant of the Mathews Woven Wire Fence Co., at Donora, Pa., which is one of the subsidiary companies of the Union Steel Co.

## AN AMERICAN IRON MASTER ON RUSSIA.

In his trip abroad last summer Archer Brown, of Rogers, Brown & Co. and their related furnace interests, spent some time in Russia. In an interview with a New York *Tribune* representative he has given the following interesting statement as to the capabilities of Russia industrially. It does not indicate that Russia is to be much of a figure in world competition, at least in this generation: "The workingmen of the United States have nothing to fear in Russian competition. Financial conditions there at present are almost as bad as in Germany, where there has been a long period of overproduction. The Russian ironmasters last year produced about two million tons of iron, but it was not of good quality. The iron industry in Russia lacks two essential things to make it worthy of consideration from a worldwide point of view, namely, honest and able management, and a good grade of ores. No high grade ores have as yet been discovered in Russia. They have superior ore in China, and it is possible they will uncover some in Russia, but as yet they have none. French stock companies have been badly bitten by spending their money in trying to develop industrials in Russia, and I cannot see where there is any attractiveness for an American investor. There is a manifest lack of character in officialdom that reacts potentially on the empire's industrial development. This is perhaps a harsh thing to say of a friendly nation like Russia, and, of course, every one must realize that there are large numbers of honest men and women in the country; but it is a fact, nevertheless, that dishonest officials take advantage of their position to hamper legitimate industry.

"What is needed in Russia today is about 50,000 miles of new railways. This would prevent the ever recurring famines in different parts of the empire by providing means of transportation for food stuffs from a prosperous section to a stricken one. The Czar is spending all the money that his imperial exchequer will stand for public improvements, in order to keep the destitute employed, but this does not relieve the great pressure to any appreciable extent. There is no money in Russia to build these much needed railways, and no foreign country will loan the funds, for the present, at least. I found that American goods were very well liked there. Our agricultural machinery is sold to the exclusion of that produced in almost any other country. I asked an intelligent and educated Russian who had visited this country how long he thought it would be before the peasant laborer of Russia would be on a moral, intellectual and financial plane as high as our own laborers, and he surprised me by saying: 'I think it will take constant development for 300 years.'

"There is no intermediate class in Russia. About 8 per cent of the people are educated and the other 92 per cent are ignorant. The educated class looks down upon business. Whenever the nobles take a hand in the management of commercial enterprises it is usually with disastrous results. The masses of the people, while physically robust, are almost absolutely void of ambition. The French have invested about $400,000,000 in Russian enterprises in the last few years, and have lost half of it. They are said to be sick of the experiment.

"In Moscow, where I spent considerable time, I saw more American goods than all others put together. Our mowers, reapers and ploughs have captured Russia, Great Britain and the Continent, but particularly Russia. The Russian Government seems to realize that the development of its vast grain fields depends more on American implements than any other one thing, and it encourages the importation by practically doing away with the duties.

"I was struck with the change in sentiment that had taken place in Russia, Great Britain and Germany since my last visit to those countries, just prior to the Spanish-American War. Two things have radically changed European opinion toward us. The first was the dispatch with which we finished the Spaniards, and the second was the demonstration in the last three years of our ability to crowd our goods into European markets. In 1897 Germans, French and many English iron manufacturers treated our growing claims as a joke. Incredulity was widespread. Now any kind of tale about our possibilities or our intentions is promptly believed.

"It seems to me that the race for commercial supremacy lies between Germany and the United States, with the advantage unmistakably with this country, in the long run. Germany is a poor country, after all. Its soil, agricultural products and mines are inferior, and in aiming to lead the industrial world it cut out for itself an herculean task. Overproduction in the last two years nearly prostrated the industries of the country, and compelled the manufacturers, in order to get funds with which to meet pressing obligations, to sell their goods for whatever they could get. The prices for iron in both Germany and England dropped 33 per cent, and production has fallen to the lowest figure in years. The only resultant benefit has been that Germany and England have resumed control, to a large extent, of their own markets. The Germans are now underbidding us in many of the markets of the world, and the English are a close second. There is a sort of hopeless tone in English and Continental papers, and in the talk of their business men on this subject, and the prevailing opinion seems to be that barriers must be built up in some way to protect their home trade.

"The Agrarians in Germany have committed the government to a new tariff law, which provides for a general advance on foodstuffs of from 50 to 300 per cent, and a large advance on manufactured articles. The manufacturers are protesting bitterly against the bill, as they believe they cannot compete outside their own empire with other nations having the advantage of foodstuffs at naturally low prices. The Berlin Tageblatt says that such a tariff will revolutionize the whole economic, industrial and commercial status of the German people, drive a large proportion of the working classes back to a diet of black bread and potatoes, and, by provoking reprisals from agricultural nations like Argentina, Austria, Russia and the United States, imperil the nation's foreign markets."

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Some phenomenal tests of Krupp armor plate were made at the Government proving grounds, Indian Head, last week. The plate was made by the Carnegie Steel Co., and the first lot of 35 tons represented a lot of 525 tons of barbette armor plate for the battleship Ohio. It was attacked by a 12-inch gun throwing a Carpenter armor-piercing projectile weighing 850 pounds. Three shots were fired at a velocity ranging from 1,621 foot seconds to 1,721 foot seconds. The first penetrated the plate three inches, the second four inches, and the third 3½ inches. Not a sign of a crack was visible, and as the penetration was less than one-quarter of the thickness of the plate it was a fine showing, and the group was accepted. This was conceded to be the best test of a Kruppized armor plate ever made. The next test was of a 2½ inch protective deck plate representing a group of 430 tons for the battleships Pennsylvania and Colorado. A 6-inch gun was used and the projectile was given the velocity of 1,930 foot seconds. The projectile struck the plate at an angle of 9 degrees and barely left a mark. This group was also accepted. The Carnegie company was represented by Ordnance Expert W. D. Balsinger, Supt. J. S. Unger of the armor plate department, and Lieut. C. A. Stone, the Washington agent.

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The first annual convention of the National Association of Blast Furnace Workers of America was held at Youngstown, O., last week. Little was done outside of perfecting a permanent organization. It was decided to divide the furnaces of the country into four districts and to formulate scales for each district. There will be a scale for the Mahoning and Shenango Valley districts, Eastern, Western and Southern districts. Officers for the ensuing year were elected as follows: President, James McMahon, of Struthers, O.; first vice-president, Michael McGlynn, of Struthers, O.; second vice-president, W. J. Clark, of Buffalo; third vice-president, Albert Geshel, of Columbus; fourth vice-president, G. H. Van Meter, of South Pittsburg, Tenn.; secretary, G. L. Mullen, of Lowellville, O.; treasurer, Thomas McClurkin, of Girard, O.; National trustees, Allen Matthews, of Lowellville, O.; James Tighe, Jr., of Brier Hill; Joseph Zellers, of Girard. The next convention will be held at Buffalo, N. Y., on Dec. 5, 1902. It is given out that no advance in wages is to be demanded, but some readjustment of working schedules.

# Open-Hearth Steel Manufacture in the United States.*

BY S. T. WELLMAN.

In choosing a subject on which to address you, it occurred to me that I could not do better than to take as a topic "The Early History of Open-Hearth Steel Manufacture in the United States." I am led to do this, first, because I was directly and intimately connected with several of the works where the manufacture was first carried on, and hence can speak from personal knowledge; and secondly, from the fact that very little has been written heretofore in regard to this pioneer work. It has seemed to me that you might possibly be interested in a short statement of the facts in regard to the starting of this branch of the steel trade in America which, beginning in so small a way, is now fast becoming the most important line of the trade.

Before taking up the subject in detail, a few facts as to the inception of the process in Europe may not be out of place. The idea of making steel by an admixture of cast and wrought iron melted together on the open hearth in a reverberatory furnace, was first proposed by the French philosopher Reaumur in 1722. We have records of this process being tried several times by different persons during the eighteenth and the first half of the nineteenth century. In France a commission appointed by the French Government under Louis Napoleon, spent a large amount of money in experiments in trying to melt steel on the open hearth of a reverberatory furnace. They succeeded in reaching the necessary temperature, but all of these early experiments failed to be a commercial success on account of the destructive action of the heat on the lining of the furnace. The heat was obtained only by intensely rapid combustion of coal or coke, which created such a cutting action on the brick work, that the furnace burned out in a very short time, and the quantity of fuel used was so enormous that the process was always a failure from a commercial standpoint.

The melting of steel in regenerative open-hearth furnaces was first proposed by C. W. Siemens in 1861. It was tried in a very small way, by one or two of his licensees, but we have no record of its having been put into successful use. Messrs. Pierre and Emil Martin at the Sireuil Works, near Paris, were the first to carry out the process on a commercial scale, they having built a furnace at their works in 1864, under a license from Siemens. Speaking of this furnace, C. W. Siemens, in a paper read before the Chemical Society, May 7, 1868, said: "It was chiefly intended for a heating furnace, but was so constructed of Dinas silica brick and of such form, that it could be used as a melting furnace." Messrs. Martin's experiments with this furnace were quite successful, and soon became known all over the metallurgical world, creating a great deal of interest.

### First American Open-Hearth Furnace.

Among the many iron masters who became interested in the process, was Mr. Abram S. Hewitt, who purchased for his firm, (Cooper, Hewitt & Co. of Trenton, New Jersey) the rights in the patents for America. Mr. Fred J. Slade, their engineer, was sent over to France to study the process. When he returned home, Cooper, Hewitt & Co. immediately started to erect a small furnace at their works in Trenton, N. J., to try the process. This furnace was of only four or five tons capacity. It was put in operation during the fall of 1868. The gas producers were of the regular Siemens type, and built from drawings furnished by Messrs. Siemens' agents in America. I was at the time assisting Messrs. Siemens' engineer, Mr. J. T. Potts, who had been sent to this country by C. W. Siemens to have charge of the erection and starting of the first regenerative furnace which was built in this country. This furnace was for the melting of crucible steel and was built at the works of Anderson, Cook & Co. of Pittsburg, Pa. I was sent by Mr. Potts to Trenton to assist Mr. Slade in the starting of their gas producers, with which they were having some trouble. This gave me a good opportunity to see the first efforts to make open-hearth steel, and I have a very vivid recollection of some of these experiments.

Mr. Slade was the only man connected with the works who had ever seen a heat of open-hearth steel melted, and as he was not a practical steel man he probably overlooked some of the important points while watching the manufacture in France. At any rate, everything bad that could happen in the manufacture of open-hearth steel seemed to fall to their lot. The best man among the workmen was the melter, who had been an old puddler, or heater, but of course he was unaccustomed to such high temperatures as were necessary to melt mild steel. The first trouble they encountered was the making of good gas. This arose from a too literal interpretation of the printed instructions for running the producers, which had been sent them by Messrs. Siemens' agents.

When I took charge of the producers, I found they were full of coal to the very top, some six or seven feet deep; so thick a fire that about all the heat in the bottom of the producers could do, was to drive out the moisture from the upper layers. Water and thin tar were running out of the joints through the whole length of the gas flue, or cooling tube, which was of wrought iron plates, placed above ground. We ran the producers for two days without charging any coal. After about twenty-four hours' work, the producers began to do good service, and we had no further trouble with them. The only difficulty was to get men to attend faithfully to the making of the gas. It is a very disagreeable job and one that demands constant watchfulness in order to get the best results.

### Details of Early Practice.

Before trying to describe the melting of the first heats, a word or two about the furnaces, and the method of casting. The furnace was a Siemens regenerative furnace, I suppose copied from one in use at Messrs. Martin's works near Paris. It had a very flat shallow bottom, but there did not seem to be much trouble in getting it up to a fair steel melting heat. The regenerators seemed to be of ample size, and the furnace fairly well designed for its work, excepting in the shape and depth of the bottom, which was entirely too shallow for the quantity of steel which it had to hold. On the casting side of the furnace, in front of the tapping hole, was fastened a kind of fore-hearth, called by the workmen from its shape, "a shoe." In the bottom of this, at the outer end, was placed a fire brick nozzle, in which was fitted a fire clay stopper, by which the flow was regulated. Running parallel with the front of the furnace, was a line of narrow gauge railroad, on which were placed the cars for the ingot molds, which were arranged for group casting. These cars were moved by a chain windlass placed at one end of the track. In all the heats that I saw made, Franklinite pig iron was used for the bath, and the balance of the heat made up from puddled bars and scrap steel. This mixture should have made good steel, but unfortunately they had no ferro-manganese, none being made at that time in this country, but little if any in Europe.

For recarbonization, they used a small quantity of Franklinite pig, according to my recollection, not more than 1 to 1½ per cent of the weight of the charge. As the Franklinite contained only about 10 per cent of manganese, this gave them a steel very low in that element, with at the most not more than 15/100 of 1 per cent, and often only a mere trace. The result was a steel that was difficult to roll, except at a high temperature. It would stand a welding heat, and a dull red heat, but was yellow short, and any attempt to hammer or roll it at that temperature, resulted in the steel going to pieces. If the furnace bottom had been made of magnesite or other basic material, the amount of manganese would have been quite sufficient to have made the steel workable at all temperatures.

### Some of the Difficulties Encountered.

In the first heat at Trenton, when the melter thought, from the small test ingots taken, that the metal was ready to cast, a small quantity of spiegeleisen was added, and when this was melted, a bent bar was driven through the sand wall between the shoe and the furnace. When this bar was with-

*Presidential address before the American Society of Mechanical Engineers at New York, Dec. 3, 1901. Mr. Wellman in illustrating his address used substantially the same drawings, reproduced in the article of Ambrose Monell on "A Summary of Development in Open-Hearth Steel Manufacture," in *The Iron Trade Review* of Nov. 14.

drawn, it allowed the steel to run out and fill the shoe to the level of the steel in the furnace. The stopper being opened, the steel ran out through the nozzle into the molds. When the first group was filled, the stopper was closed, and the car was moved along until the next group came under the nozzle. In this manner, about one-half of the molds were filled when the nozzle in the bottom of the shoe began to close up by the metal chilling. It soon closed up entirely, and the car was then moved along until the next group of molds was in place under the nozzle, when the whole nozzle was lifted out of its place, and the steel then came with a rush for a short time. This operation was repeated until all the steel that was liquid had drained out of the furnace; but only a small proportion made ingots that could be rolled—the larger half were scrap.

The great difficulty in these pioneer days of steel making, was to teach the melters to maintain the steel at the proper temperature. The margin between the proper casting temperature of the steel and the melting point of the furnace itself, was very limited—much more so than today, as at that time no silica brick were available, and we were obliged to use clay fire brick for the roof and sides of the furnace. Shortly after the heat which I have mentioned, I saw an attempt made to cast a charge which had chilled in the nozzle, so that it could not be started again. By the time the shoe could be taken off, the steel had chilled solid, clear back into the furnace, which was then shut down half full of steel. The next day the furnace was started up again. A quantity of pig iron was added and the steel finally all melted, but it was so slow in coming to a steel melting heat that the carbon was reduced, and several more additions of pig iron had to be made, until finally the furnace was over-filled, making it all the more difficult to get the proper temperature. It was finally tapped, but it was so cold that it chilled in the nozzle and the forehearth, so that when the latter was taken off, the steel ran down over the molds, cars and tracks, welding the whole together, and making a mess that I was afterwards told took two weeks to clean up so that the furnace could again be started.

These are only examples of the difficulties and rough experiences which were encountered in these initial trials, and it was no wonder that poor Mr. Slade was discouraged.

As is very often the case, this experiment was not very profitable to the pioneers, Cooper, Hewitt & Co. The furnace was operated at intervals for a year or two, but was finally abandoned. The manufacture was stopped, as it was not a commercial success. Those who saw these experiments were able to profit by them and avoid many of the difficulties encountered in them.

### The Process at the Bay State Iron Works.

The second works to make open-hearth steel in America, and first to make a commercial success of the manufacture, was the Bay State Iron Works, of South Boston, under the superintendence of Mr. Ralph Crooker. Mr. Crooker was an iron master of the old school, and at the time of my association with him had been connected with the management of iron works in one capacity or another for over 50 years. The Bay State Iron Co. had been manufacturers of iron rails for many years, but about this time the advent of steel rails had induced them to experiment in the manufacture of steel headed rails.

Their first experiment was with puddled steel, which was used in the head of the rail, in place of the hard wrought iron which had generally been used for that purpose. As this did not prove to be a success, Bessemer steel ingots were brought from Troy and rolled into bars, which were used in the pile to form the head of the rail. This also was unsuccessful. Bessemer steel as then made was found to be very irregular in quality and sometimes impossible to weld. At this stage, Mr. Crooker's attention was called to the experiments that were being made in the manufacture of open-hearth steel at Trenton. He visited the works, and after watching the process for some time he became convinced that with a properly constructed furnace and the use of ferro-manganese, a good weldable steel could be made. He tried to make some arrangements with Messrs. Siemens' agents to supply him with plans for a furnace such as he wanted, but failing in this he sent for me, I having left Messrs. Siemens' employ several months before this. I soon came to terms with him, and in a few weeks we had the plans well in hand and started the construction of the proposed works.

The erection of the works was started in 1869 and was completed in a few months. The plant was put in operation early in 1870. It consisted of one furnace of a capacity of five tons. The necessary gas producers were also built, as well as a coal-fired preheating furnace. Several anthracite crucible steel-melting furnaces were also built for the manufacture of ferro-manganese. The melting furnace was a very powerful one for its size, sharp and quick in its working. The arrangement of ports gave a very good mixture of gas and air, there being several small ports, side by side, with thin division walls between them. These walls were only 4½ inches thick, which necessitated very frequent repairs, as these thin division walls frequently burned through. Otherwise the furnace was all right, and many furnaces have been built since that did not work as well as this one. The bath was made much deeper than the one at Trenton in proportion to its size. The metal was cast through a fore-hearth in much the same manner as at Trenton, but the ingot molds were carried on a large turntable resting on conical rollers, which was turned by a steam engine through the medium of bevel gearing. This made a very good arrangement, and as it was well designed and built it gave no trouble in operation.

The melter was a skilled heater who had been in the employ of the Bay State company for many years. He was a man of most excellent judgment, ambitious, faithful and conscientious in his work. He had the advantage of spending a few weeks at Trenton, watching that furnace in operation, and was able to start up the Bay State furnace without much trouble, and soon became a first-class melter. The Bay State plant started off with one very great advantage over that at Trenton, in that they had ferro-manganese to use for the final additions in the process. As this could not be purchased at that time, we were obliged to make it in crucibles. This made it very expensive, but, as the quantity used was small, the expense did not amount to much per ton of steel. The ferro-manganese was made by reducing black oxide of manganese in crucibles, with charcoal and lime at a very high temperature. When nearly, or quite melted, spiegeleisen or Franklinite pig iron containing about 10 per cent of manganese was added to the melted manganese in the crucible; and when the whole was thoroughly melted, it was poured out into flat molds. Most of this ferro-manganese contained 35 to 40 per cent of manganese, not very rich when compared with the 80 per cent ferro that is turned out of the blast furnaces in these days; but it answered the purpose, and by its use we were able to make steel of from 10 to 15 carbon that was perfectly malleable at all temperatures. This was a very important advance over the first experiments at Trenton. The first steel was made from a mixture of puddled bar iron made in their own furnaces, with some scrap steel, melted in a bath of English West Cumberland hematite pig iron. This steel was rolled into bars about 7 inches wide by 2 inches thick. This bar was used for the top of the rail pile and formed about one-fourth of its weight, the remainder of the pile being made of old iron rails. The weld was apparently as sound as if it were iron on iron. Quite a large quantity of rails were made in this manner, and were put into use, but the day of "weldless steel rails" had come, and while the steel headed rails gave better results as to wear than those of iron, they did not begin to do as well in that respect as those of solid steel. They lacked the strength and stiffness of solid steel, and these latter qualities had as much to do with good wearing results as the mere difference of hardness of the head.

It soon became apparent to the Bay State company that the steel headed rail was a failure, and that they must look to some other outlet for the product of their steel plant. They were large makers of iron plates as well as rails. Their flange plates had a good reputation, but were costly to make, being puddled from charcoal pig iron. Added to this expense, was the tremendous loss from blistering, the average being from 40 to 50 per cent. This meant that amount of the plate being cut up and worked over again—a very serious item of cost. These troubles and the fact that some very good flange and fire box steel had been made in Pittsburg in crucibles, induced them to experiment in the manufacture of

soft steel plates, rolled from ingots made in the open-hearth furnace. The first were made from their own bars, puddled from charcoal iron, but this was not satisfactory, as the iron contained too much phosphorus. After quite an amount of experimenting, a small quantity of steel was made from blooms made in the Lake Champlain district direct from the ore in the old-fashioned Catalan forge. The result was most satisfactory; a beautifully soft, ductile steel was produced that was perfectly malleable, hot or cold. Plates rolled from it never showed a blister, and very few defects of any kind, and most satisfactory of all was the fact that it could be produced much cheaper than the best iron flange plates. A great many samples of this plate were sent around to their different customers, and the company very soon secured a large trade in boiler and fire box plates, which they were able to hold for several years. Only one furnace was ever built at the Bay State Works, but this furnace was run day and night for several years in the manufacture of the highest class of ingots for boiler and fire box plates. As the price was very high, this small steel furnace earned a great deal of money for the company.

### Further Advance by the Nashua Iron Co.

The next firm to build an open-hearth furnace was the Nashua Iron Co., at Nashua, N. H. This was a five-ton furnace, built under license from Messrs. Siemens. After I had finished and started the Bay State company's plant, I was employed by the Nashua company (of which my father, Mr. S. K. Wellman, had been for many years superintendent), to build and take charge of the new steel department of the Nashua works, consisting of the open-hearth furnace plant, and a plate and bar mill. The building was started in 1871, and completed and put in operation the following year. There were some radical changes made in the plant from that of the Bay State company. No preheating furnaces were used. When blooms were used, they were heated in a pair of chambers on the charging side of the furnace, and were pushed off into the bath when they had reached the proper temperature. English hematite pig iron was used for the bath, to which was added charcoal blooms from the Lake Champlain district, similar to those used by the Bay State company. These were used for the best quality of steel; a cheaper grade was made from steel and iron scrap and pig iron. Ferro-manganese was melted in a regenerative crucible steel melting furnace from a mixture much the same as that used at the Bay State Works. The steel was tapped from the furnace into a ladle, mounted on a car running on rails, these being placed on each side of a deep casting pit, in which the ingot molds were placed. This pit ran at right angles to the furnace, the ladle car being hauled by a chain and windlass worked by hand. This made a cheap and effective casting arrangement. For a stationary furnace it had a great advantage over the use of a shoe, similar to those used on the Bay state and Trenton furnaces, as no matter how cold the steel was, it was always hot enough so that it ran "clean" out of the furnace. While some of it might chill in the ladle, the furnace was not interfered with at all, and we were able to get out the next heat without interference from steel being left in the furnace.

Such a casting arrangement as that used at Nashua would not answer in these days of 50-ton furnaces, but it answered the purpose very well at that time. I have a vivid recollection of the first week's work after we started up the furnace at Nashua. We ran single turn, and were trying to make steel from cheap stock for some common forgings. But not an ingot in the whole week's work would forge at any temperature, and you may be sure I went home that Saturday night sick in mind and body. I do not remember the sermon on that Sunday; but before Monday morning I had found out the trouble with my steel making, and after the first heat on Monday morning, which proved to be all right in every respect, things looked brighter to me. From that time on we had no serious trouble in making any steel we wanted.

The Nashua company were large manufacturers of forgings for railroads and marine uses, and much of the steel made by them was used to take the place of iron for this purpose. They also secured quite a large trade in boiler and fire box plates, and later on they commenced to manufacture steel for locomotive and car wheel tires. Some years later, this five-ton furnace was torn down and a furnace of 10 tons capacity was built in its place.

About the same time that the Nashua company were building their first furnace Singer, Nimick & Co. of Pittsburg, were building a furnace of about the same size, which was put in operation about the time of the one at Nashua. It was used for the manufacture of mild steel, principally for boiler and fire box plates, which they had previously made from crucible steel.

### The Advent of Otis Open-Hearth Steel.

Following the starting of the open-hearth furnace at Nashua, and those of Singer, Nimick & Co., there came the new works of the Otis Iron & Steel Co. of Cleveland. This was the first plant in the United States to be built for the exclusive manufacture of open-hearth steel. I was engaged by the company to build and take charge of the works. A splendid location was found, almost in the heart of the city of Cleveland, and near the shore of Lake Erie, with the Lake Shore & Michigan Southern Railroad on one side and the Pennsylvania Railroad on the other, giving ample railroad facilities with competition both on incoming and outgoing freight.

Ground was broken for the erection of the works in the summer of 1873, but they were not finished until the fall of 1874. At my suggestion, Mr. Alexander L. Holley was appointed consulting engineer and he served the company for several years in that capacity.

I had seen Holley but once before he came to Cleveland on the occasion of his first visit as consulting engineer, and that was seven years before. He was then in charge of the works at Troy, and as I wanted to learn the steel business I asked him to give me a position there. He told me that he had no vacancies at that time. On his first visit to Cleveland I recalled this circumstance to him and laughingly said, "As long as you would not give me a position, I have at last succeeded in getting you one." This was the commencement of one of the most pleasant friendships of my life, which lasted until Holley's death.

### Features of the Otis Works.

Many plans for the general arrangement of the works were worked over between us and the one finally adopted, with some minor alterations, was suggested by him. The steel melting plant as originally built consisted of two 7-ton furnaces with a regenerative preliminary furnace for preheating the blooms, before adding them to the bath, and a regenerative crucible ferro-manganese furnace. The most radical improvement over old practice was the raising of the charging platform about 10 feet above the general level, the material to be melted being raised by hydraulic elevators. This arrangement made the furnaces very accessible for repairs, and also gave the great advantage of our being able to have a very shallow casting pit. This plan is still followed by the latest and best works in this country.

The steel was tapped into a ladle, as at Nashua, only instead of supporting the ladle on a car, it was carried on the arms of a jib crane, which was simply a swing without any lift. This made a simple and cheap casting arrangement, and one that was perfectly safe. The one crane stood on the center line between the two furnaces, and the ladle swung around to the tapping spout of each. There being no lifting of the ladle when it was filled with metal, there could be no breakdowns or upsetting. One disadvantage of not being able to lift the ladle was that we were obliged to bring the top of the molds or groups to very nearly the same height. In the case of molds of different lengths, this was sometimes a disadvantage, but the safety of the whole arrangement more than compensated for any disadvantage that we were put to from this cause. A swinging platform for the workmen to stand on when tapping the furnace, was supported at one end on the mast of the ladle crane, and at the other on wheels that ran on the plates which covered the walls of the casting pit. The furnaces were very simple in construction, and much like the one at Nashua, excepting that the heating chambers on the front of the melting furnace had been dispensed with, and a preliminary furnace used, as at the Bay State Works. One furnace with doors on each side served for the two melting furnaces. The first heat of steel was made in October, 1874, from charcoal blooms from the Lake

Champlain District, melted in a bath of Lake Superior charcoal pig iron. This steel was naturally of very high quality and was made into plates for fire boxes.

The starting of the works was attended with the usual mishaps, which always seem to attend the launching of new enterprises, especially in the iron business. The first thing to happen before any metal had been charged into the furnaces was a terrific gas explosion, which cracked the main gas flues, loosened up the gas and air valves, smashed manhole plates, and escape valves, and loosened things up generally. After our furnaces were started, they were occasionally fused down by careless melters, and the steel did not always prove to be what we expected; but a careful system of inspecting prevented these mistakes getting to our customers, and after a few months of schooling of this kind, things began to work smoothly, and we had comparatively little trouble in making what we wanted. Of course, we had to educate all of our skilled men; we had no works to go to from which to hire them, and so had no other way except to educate them. Our head melter, who originally came from New England during the construction of the works, was by trade a bricklayer, a bright and observing fellow, who was ambitious to learn the steel melting business. I sent him to Nashua and Boston some two or three months before we started up the works, to learn what he could about the operation of the furnaces. Of course, for a time he needed constant watching, but after a few months' work, he became a very expert melter. Nearly all of our skilled men learned their trade after entering the employ of the Otis company. When I severed my connection with the company, after sixteen years' service, out of about 1,000 employes I was able to learn of only one skilled workman who had not learned his trade in the shops of the company.

Not only men, but all of our materials, had to be tried and proven. The question of fire brick, as well as of other refractories, was an important and troublesome one, and a great deal of experimenting had to be gone through with before the best materials could be found. In the meanwhile, we were building up a good reputation for the quality of our product, which was principally plates for boilers and fire boxes. "Otis Steel" was for many years a standard brand for the purpose in this country, and sold at the very highest price.

In 1878, two 15-ton furnaces were added to the plant. These were a great success from the very start, and were at that time regarded as of immense size. They were a radical step in advance of anything that had been built up to that time. In 1881, two more 15-ton furnaces were added, and in 1887 two more of the same size. These last two were a radical departure from anything that had been built before, in that the regenerators were under the charging platform, instead of under the furnace proper. The opening into the regenerators was at the end next to the furnaces, instead of at the top, which is necessarily the case where the regenerators are underneath. This opening from the regenerators was into a large slag pocket, directly under the ports. This was the case both with the gas and air regenerators. Since that time, this type of melting furnace has been very largely used in this country. All of the late furnaces at the Homestead Steel Works, Duquesne Steel Works and the Sharon Steel Works are of almost exactly this type. The Otis works were at one time the largest open-hearth plant in this country.

As I have said, the principal raw material used at the start for making the high quality of soft steel which was turned out at the Otis steel works was charcoal blooms from the Lake Champlain District. These were used in largely increasing quantities from year to year, until the consumption reached as high as 12,000 to 15,000 tons per year, at an average cost of $45 to $60 per ton. This seems like an enormous price to pay for raw material. It was; but as the finished plates were sold at from $135 to $160 per ton, a fairly good margin was left for profit.

Later on, a larger amount of puddled blooms were made from Bessemer pig iron in mechanical puddlers. Washed metal made in revolving Pernot furnaces by the Krupp-Bell process was also used.

### First Basic Steel Made at the Otis Works.

The first basic steel produced in this country was made at the Otis works in 1886. During a visit to Europe in 1885 I saw the process at work and was much impressed with its possibilities. I immediately arranged to have a small cargo of Styrian magnesite sent over, and as soon as we could spare a furnace to make the experiment, we put in a lining of calcined magnesite on top of the silica bottom, which had been melted down as low as possible. This magnesite was not fused in, as is the practice in these days, but after being mixed with tar, was rammed in place while the furnace was cold. This was the practice in Europe at that time, and we simply followed out what we had seen on that side of the water. As soon as the bottom was made, we started up the furnace, which was operated experimentally for some four months, making a good quality of basic steel. All of it went to our regular customers in our regular trade, without any fault being found. It was kept as a great secret, and no one outside of the company's works knew what we were doing. During all of this time we were extremely busy. The basic process was much slower in operation than the acid, and this made the output of the furnace so small that I was at last forced to yield to the pressure brought by the selling department for more steel and changed the furnace back to the acid process. Some months later the basic process was started at the Pennsylvania Steel Co.'s works at Harrisburg and the Carnegie works at Homestead. Today at least three-fourths of all the open-hearth steel made in America is manufactured by the basic process and this proportion is bound to increase. It is my opinion that there is no question about the fact that the very best qualities of all grades of open-hearth steel can be made cheaper and better by the basic process than in any other way. The basic process of steel-making is so simple, both in theory and practice, that it seems strange that it was not thought out and put in practice before it was. The same principles are involved and the same reactions go on in the puddling process which has been in use for generations. The only difference is that the temperatures are lower in the puddling furnace than in the open-hearth; as a consequence the lining in the latter must be the more refractory.

Twenty-five years ago it was considered an axiom that phosphorus could not be removed from iron at a high temperature, but the invention of Snelus and Thomas demonstrated that it could be done. Today thousands of tons of steel are being made by the basic open-hearth process from iron containing more that 50/100 of 1 per cent phosphorus, that is better in every respect than was the steel of which I have been telling you, made from costly charcoal blooms containing only 2 to 3/100 of 1 per cent of that element.

### Rapid Extension of the Open-Hearth Industry.

Very soon after the Otis Steel Works were started, open-hearth furnaces began to be erected all over the country. They were built by the Pennsylvania Steel Works at Steelton, Pa., Cleveland Rolling Mill Works at Newburg, near Cleveland, the Shoenberger Works at Pittsburg, and many others, among all of which the Carnegie Works at Homestead were the most important. This is today the largest open-hearth plant in the world, consisting of 48 furnaces, of a capacity of from 40 to 50 tons each, having a total capacity of at least 1,300,000 tons per annum. The size of furnaces has increased from the little 5-ton furnace at Trenton and Boston up to those having a capacity of 50 tons, which is the average size now being built. Furnaces of this size nominally, at Ensley, Ala., have made heats yielding 74 gross tons of ingots.

Furnaces of 100 tons capacity are being built, and designs have lately been made for a furnace which will probably be built, of 200 tons capacity. These large furnaces, however, are not properly melting furnaces, as the bulk of all the iron is charged into them in a liquid state, direct from the blast furnace. They might more properly be called converting furnaces.

The output of open-hearth steel has grown from 893 tons in 1869, to 3,402,552 tons in 1900, against 6,684,770 tons made by the Bessemer process in 1900. But few new Bessemer converters have been built in this country for several years, and it is not likely that many more will be built. The production of basic open-hearth steel in this country will soon exceed the Bessemer in tonnage. Holley used to say: "The open-hearth process will some day go to the funeral of the Bessemer." It will be many years before that will come to pass, but the day is not far distant when the great bulk of all the steel in this country, at least, will be made on the open hearth of the Siemens regenerative furnace by the basic process.

## POTTER MESH SEPARATOR AND SUPERHEATER.*

BY FREDERICK A. SCHEFFLER, NEW YORK.

Various designs of dry pipes have been made, all of them with a view of accomplishing the same result namely, that of affording a receptacle for the steam passing out of the boiler, and so devised that steam only, and no water, should pass through the dry pipe. The very fact that these various forms of dry pipes (sometimes deflectors were used) have been changed in design, and also that in many instances the dry pipe has been abandoned for another device equally deceptive, without eliminating the difficulty, is proof that none of the old methods were satisfactory under all circumstances, and that a form of dry pipe which might be suitable in one case would not apply in another equally well.

I have no doubt that many members in reading or discussing this paper can recall their experience with priming or foaming boilers, and what they did to prevent disastrous accidents from occurring to their engines and other machinery.

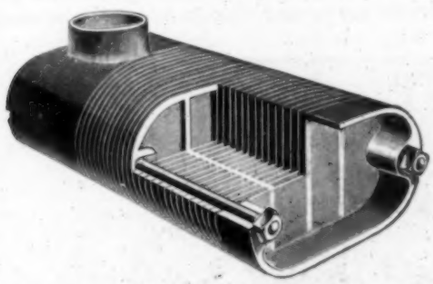

FIG. 1.—ELEVATION OF POTTER MESH SEPARATOR, WITH SECTION CUT OUT SHOWING INTERIOR.

This is an experience which many of us have had. It is a well-known fact that under certain operating conditions even the best designed boiler is likely to "throw water," or prime or foam badly. This may be due to various causes, which we have not the time to discuss now, and frequently is not due to improper construction of the boiler.

The Potter mesh separator is designed to prevent the trouble above referred to from occurring within the boiler itself, and while boilers equipped with the apparatus may prime for various reasons, the separator makes it impossible for the boiler to "throw water." The device is placed in the steam space of the boiler, and is connected in a manner similar to a dry pipe, or it can be connected to the end of the dry pipe, and the holes in the latter stopped up. The construction of the separator is shown in Fig. 1 and also in longitudinal and sections (Figs. 2 and 3). It consists of a series of galvanized or copper wire meshes or screens placed alternately between rings of cast iron, there being generally from 25 to 30 layers of mesh. The area of the screens depends on the size of the boiler outlet.

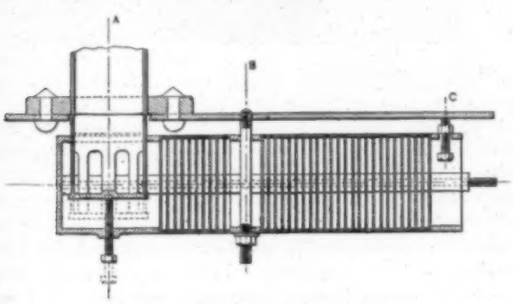


FIG. 2.—LONGITUDINAL SECTION.

After considerable interesting experimental work, involving many other designs, more or less complicated, the above construction is found to fulfil all conditions of priming, over-saturated steam, etc., and delivers at the boiler outlet practically dry steam.

It has also been found by careful experiment that, given any boiler from which steam is delivered at any particular range of moisture (with or without "dry pipe"), the introduction of the mesh separator in the same boiler will change the quality of the steam from 25 to 75 per cent (making it drier), and at the same time stop any priming which may have been present.

The theory on which the action of this separator is based is, as may already have been surmised, that the small globules of moisture contained in the steam are broken up by the first piece of mesh, and this action is continued through each successive layer of mesh until it is so completely atomized upon reaching the outlet chamber, or header, that it flashes into dry steam upon the addition of a small amount of heat, which is obtained by the wire-drawing due to the steam and water passing through the screens. The reduction of pressure is about 1 per cent, and the temperature of the steam is increased proportionately.

The separator is designed so that it can be placed in any type of boiler which is equipped with a manhole of the usual size (11 inches by 15 inches), and is held in position by one or more studs screwed into the shell of the boiler. The

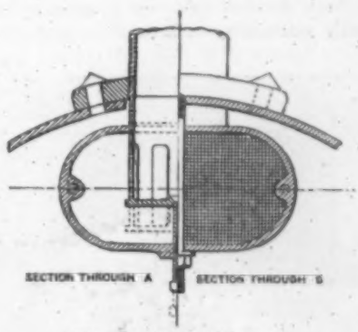


FIG. 3.—CROSS SECTION.

connection between the outlet of the separator and boiler outlet is not necessarily steam tight, nor are the joints between the faces of the rings and wire mesh steam tight, as these openings are so small that any steam which leaks through such spaces is slightly wire-drawn with the same result which occurs to the steam passing directly through the mesh of the separator. These small openings on the lower part of the separator also provide the means whereby the entrained water returns to the boiler as it trickles down the successive layers of wire mesh.

Tests recently made by the writer in a 3,000-h. p. electric plant with and without the separator are graphically shown in Fig. 4, together with water-level readings taken simultaneously with the calorimeter readings. These readings were taken every minute for five minutes over several hours' duration, at ten-minute intervals, and in plotting the curve it will be noted that the average readings for each five minutes were used to give the ordinates. A Carpenter throttling calo-

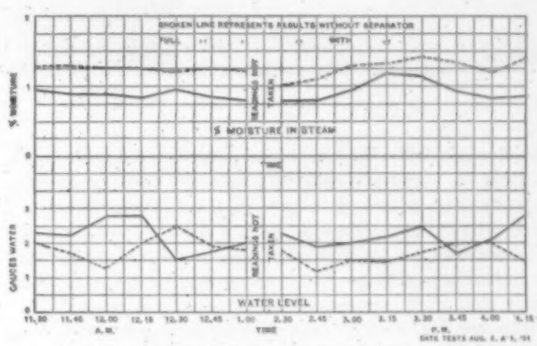


FIG. 4.—TESTS OF POTTER MESH SEPARATOR.

rimeter was used, as the readings at no time exceeded 2½ per cent of moisture.

In this particular case the tests show that the steam issuing from the boilers contained 37½ per cent more moisture when the separators were not used than was the case when they were used, and this, notwithstanding the fact that the water level in the latter instance averaged materially higher than in the former. Before these separators were installed, this particular plant was frequently troubled with water in the engines, but this difficulty has entirely disap-

* Read at the New York meeting (Dec. 3-6, 1901) of the American Society of Mechanical Engineers.

peared; so that, as heretofore stated, the separators prevent the water from leaving the boiler, besides supplying a higher quality of steam. This test was made on boilers which, as the curve shows, would ordinarily furnish a very fair quality of steam, and the test casts no reflection on the makers of the boilers. If, however, by applying the improvements in "dry pipe" construction, the possibility is assured of keeping the water in the boiler, and at the same time increase materially the quality of the steam at the boiler outlet, then the plant as a whole is improved in efficiency. There will be far less condensation to take care of in such installations between the boilers and the engines, and there will also be eliminated the likelihood of damaged engines, providing the condensation is properly looked after.

Negotiations are reported in progress for a combination of the foreign and domestic manufacturers of pneumatic tools, with a capital of $10,000,000. The name of the concern has not yet been decided upon. It is proposed to manufacture pneumatic machinery, such as drills and riveters, which are used extensively in mining, submarine and bridge work, as well as in foundries, railroad shops and other industries. At present it is proposed to take in the Chicago Pneumatic Tool Co., the Boyer Machine Co. of Detroit, the Franklin Air Compressor Co. of Franklin, Pa., and the Tate-Howard Co. of Manchester, Eng.

At the regular monthly meeting of the Engineers' Society of Western Pennsylvania, held at Pittsburg, Tuesday evening, Nov. 19, Richard Hirsch read a paper entitled "Compressed Air Haulage Plants." The following were admitted to membership: H. H. Anderson, assistant engineer, American Sheet Steel Co., Pittsburg; F. W. Kennedy, mechanical engineer, with American Sheet Steel Co., Vandergrift, Pa.; F. Lichenstein, consulting engineer, and Charles Worthington, consulting engineer.

It is reported that the entire product of the Eleanor Iron & Steel Co., Irwin, Pa., has been sold to the National Tube Co., for a period of three years. The output of the plant will be 100 tons per day when completed, consisting mainly of rolled skelp.

## NEW AUTOMATIC SCREW MACHINE.

The automatic screw machine, shown in Figs. 1 and 2, has a chuck capacity from half an inch down. It is built on somewhat different lines from other machines. It weighs 1,500 pounds and is solidly and compactly built. The legs are cast in pairs. One pair is attached directly to the oil bed; the other is hung on a rocking shaft, which enables the machine to be bolted very firmly to the floor without straining any of its parts. Another feature is the method of belting, this machine being driven with but one belt. This assures perfect safety. No breaking of lacing will allow the feed to break company with the rest of the machine and ruin the work as may be done in driving the feed independent of the spindle. A further advantage of this method of belting is the fact that the machine can be placed on the floor at a slight angle with the main driving shaft and still have the belt draw even and true. In this way the machines can be placed close together and in a line down the length of the shop.

The drums are a new feature in automatic machinery.

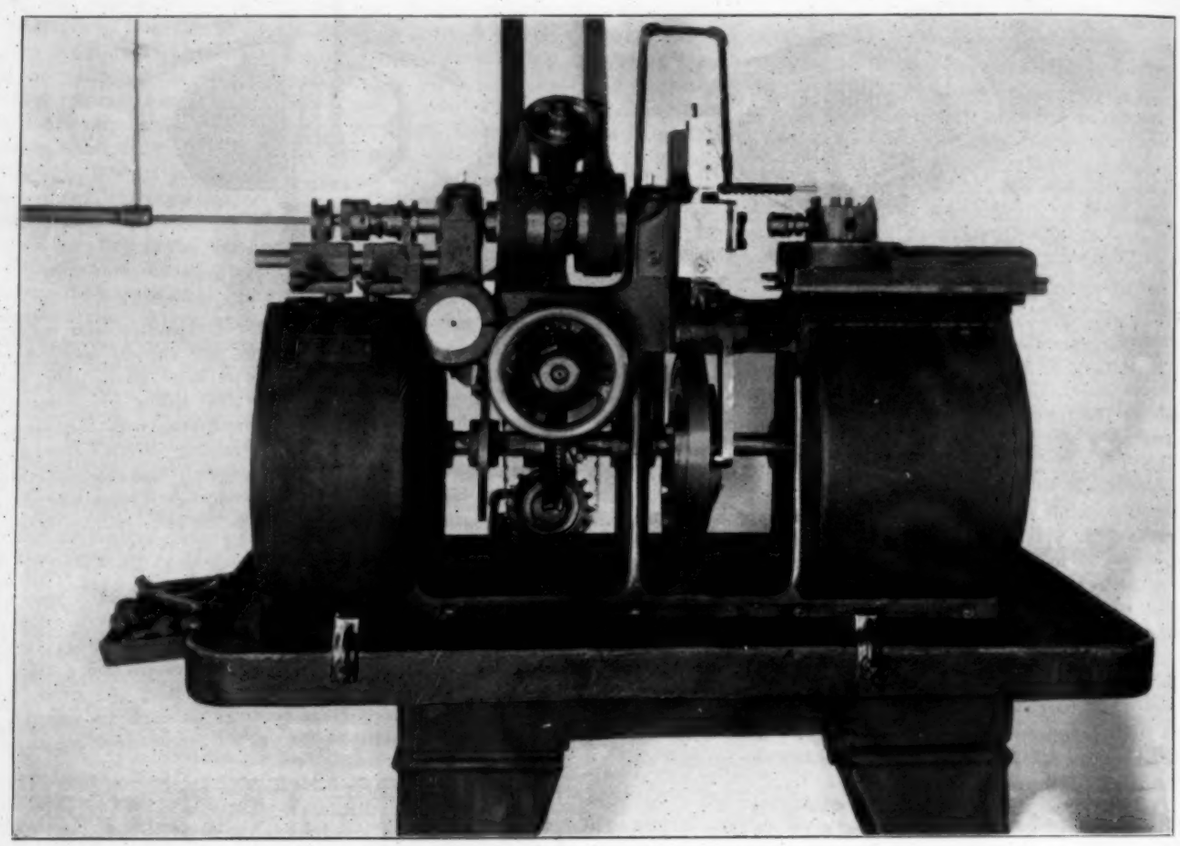

FIG. 1.—FRONT VIEW OF NEW AUTOMATIC SCREW MACHINE.

Instead of using the old flat-faced drum requiring the use of straps bolted to its face, (these causing trouble because set by guess), the drilling and tapping of holes, etc., the builders of this machine have adopted the method of fastening the cams to these drums by T bolts. In this way a machine can be changed from one class of work to another in a few minutes and adjusted to a certainty. These drums are also covered with substantial casings which can be readily removed for adjustment and replaced as quickly. This method of caming automatic machinery is claimed to be a long step in advance of the ordinary way.

The entire feed mechanism is engaged or released by the use of a clutch on a hand wheel placed in front of the machine and the operator can stop or start the feed while the machine is in motion. By releasing this feed clutch, the feed mechanism can be moved forward or backward by the use of the hand wheel. This is of course a useful feature in setting the machine for the different kinds of work. There is also a device by which the feed can be accelerated for bringing the different tools into position without loss of time.

The automatic wire feed is controlled by hand levers. The spindle is provided with friction clutches which are shifted by dogs on the feed shaft. This device is of such a nature as to be engaged and disengaged without any concussion and still be positive in action.

The turret is provided with holes for four tools, and is so constructed as to be removed entirely if so desired and replaced in exact position by simply releasing one screw. It is provided with a positive stop and with a device by which it can be turned completely around if necessary without being carried forward and backward for each hole. In this manner two tools can be used and no time lost in passing by the vacant places.

There are two cross slides on the machine together with a vertical slide, but in this feature the designer has departed materially from the ordinary construction. Instead of being placed horizontally, the cross slides are held vertically. Each slide is independent of the other and is provided with a fine adjustment. In this manner no chips nor dirt can fall between the slides and cause trouble. It allows the machine to be built much more compactly, the turret slide is shorter, and in many ways this is a great advantage. The machine is provided with a device by which the work is taken from the bar when completed, carried against a slotting saw

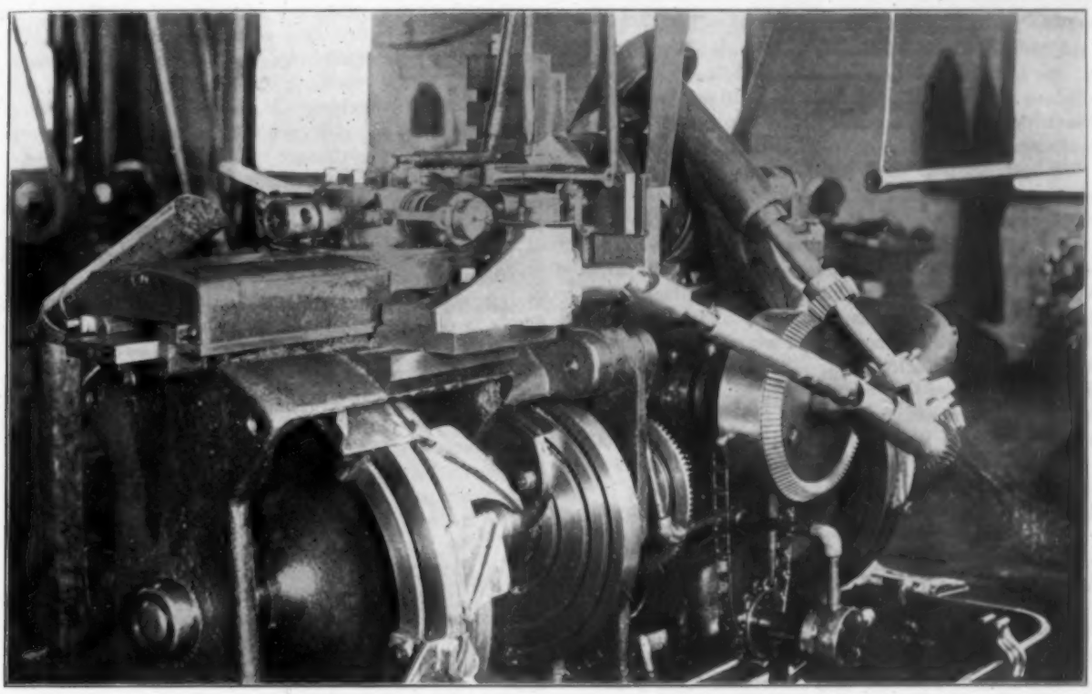

FIG. 2.—REAR VIEW OF NEW AUTOMATIC SCREW MACHINE.

when required, and deposited in a receptacle provided for it; this feature is best seen in Fig. 2. In this way, the annoyance and loss of time caused by the finished product falling in with the chips and oil is avoided.

The machine is built by the Automatic Machine Co. of Greenfield, Mass.

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The plant of the Gruson Iron Works, Eddystone, Pa., is now in operation, making all kinds of castings for the trade, and a specialty of chilled iron castings. Ultimately the plant will be used for manufacturing Gruson chilled iron segmental coast defense turrets. These are at present built at the Magdeburg plant of the Krupp Company in Germany.

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Employes of the Edgar Thomson, Duquesne and Homestead Steel Works of the Carnegie Steel Co., have been notified that after Jan. 1 the company will only pay 4 per cent interest on money deposited with it. Heretofore the company has paid 6 per cent; the reduction is due to the fact that interest rates generally have fallen.

## THE CLEVELAND MACHINERY MARKET.

The intense activity heretofore noted in the Cleveland machinery trade continues with unabated vigor. Most shops report excellent business and good prospects; in many cases the stress of trade is demanding better facilities than present locations can provide and plans are being prepared for extensions. It is generally recognized that a straight manufacturing business is an altogether different proposition from the handling of a jobbing shop and it need not be placed directly in the neighborhood of the customers. The class of help is not so migratory in its habits and this and other reasons are directing the attention of Cleveland manufacturers to the suburbs. There is a strong probability that along with the new Lake Shore shops at Collinwood there will be some new machine shops in that locality.

The Chisholm & Moore Mfg. Co. has decided to extend its plant and will erect several new buildings. These will be of fireproof construction, brick and iron. Two buildings one story high will be 63x109 feet and 25x57 feet; another is to be 30x150 feet and probably two stories high.

The Cleveland Wire Spring Co. is making additions—two new buildings, 140x75 feet, besides a second story addition, 120x40 feet, to another building.

The Acme Machinery Co. is crowded to its full capacity in every department on the regular lines of bolt and nut machinery. During the past two years the firm has about doubled its capacity and at the present time has an addition to the engine room under construction. An order for another power unit has been placed. It will consist of an 11x12 Skinner steam engine direct connected to a 50-k. w. electric generator. The company reports encouraging indications for the coming year. It is receiving many domestic orders and inquiries but notices a slight falling off in the foreign business.

The Parish & Bingham Co., manufacturer of cold pressed metal work, are extremely busy. Plans have been drawn for a new factory, 50x300 feet and two stories high, building operations to begin next year.

The newly incorporated Krastin Automobile Mfg. Co. will erect shops on the south or west side of the city. The company has a capital stock of $200,000 and will give employment to some 200 workmen. Mr. Krastin controls a number of patents on automobiles driven by gasoline engines and has already finished four machines at the Cleveland shop on Clark Ave. near Burton St.

The Cleveland Punch & Shear Works have found it nec-

essary to put their force at work two nights each week for some time past. The bulk of the work now under way is for unusually heavy tools, a demand that has taken on remarkable proportions and is every year increasing. A recently filled order for the Riter-Conley Co., manufacturer of structural iron work, Pittsburg, called for a set of straightening rolls weighing 35,000 pounds. A plate planer for the same company was recently furnished. This was about 50 feet long, to cut a chip about 48 feet, and the machine weighed 56,000 pounds. A punch weighing 16,000 pounds has been recently shipped to the Atlas Engine Works of Indianapolis.

The Turner, Vaughn & Taylor Co., Cuyahoga Falls, O., intends to make a number of improvements in the spring. The present machine shop will be dismantled and a new foundry will be erected there of greater capacity than the present one. A machine shop will be built adjoining the newly-finished erecting shop and will contain the present equipment together with an assortment of new tools.

The Cleveland Crane & Car Co., manufacturer of cranes, rolling mill cars, etc., reports a greater amount of business than usual during the last two months, with conditions generally much better than in the first half of the year. The company is over-crowded in the present shop and finds its facilities too limited. A new plant is under consideration. The following orders are now in the shop for electric traveling cranes: Four for the Pennsylvania Steel Co., Steelton, Pa.; one for the Morse Iron Works, New York; two for the Government; one for the City Foundry Co., Cleveland; and two for the Ridgeway Dynamo & Engine Co., at Ridgeway, Pa.

The Porter Mfg. Co. of Syracuse, N. Y., has sold out the entire equipment of its machine shops, foundry, boiler shop, pattern shop and drafting room to the Reade Machinery Co. of Cleveland.

The slackening of the export trade in general does not seem to affect the foreign business of the Cleveland Pneumatic Tool Co. The company is receiving orders from all parts of the world and is just about as busy in the manufacture of pneumatic tools and air driven appliances as the present equipment will permit. Shipments have recently been made to Germany, Austria and Holland.

The Edmonds Elevator Co., manufacturer of passenger and freight elevators, is increasing its shop equipment and has placed orders for a new lathe, 36-inch swing, and a universal milling machine which are to be delivered inside the next two weeks. The list of orders at present on the books includes the following: Electric freight elevator for M. Streibinger's new block, Cleveland; electric freight elevator for Benjamin Rose's new block on Broadway, Cleveland; power freight elevator for the Canton Fertilizer & Chemical Co., Canton, O.; belt elevator for E. R. Leighteon's block occupied by the Elwell-Parker Electric & Mfg. Co.; 11-ton hoist for Sherwin-Williams Co., Cleveland; 6,000-pound belt elevator for the Standard Foundry Co., Cleveland; hand power elevator for the Cardington Novelty Co., Cardington, O.; 6,000-pound belt elevator for the Carnahan Stamping & Can Co., Canton. O.; two belt elevators for the Grossman Paper Box Co., Cleveland; 6,000-pound elevator for the National Screw & Tack Co., Cleveland; belt elevator for the Cleveland Bag Factory; belt elevator for Pullman, Ill.; belt elevator for Willoughby Fork & Mfg. Co., Willoughby, O.; three direct acting plunger lift elevators for the Cleveland *Press;* direct connected electric freight elevator for the Y. M. C. A., Cleveland.

The business of the Bodifield Belting Co. is steadily increasing—it being this year three and a half times larger than in 1898. It was predicted that leather belting would to a great extent go out of use, that the direct connected generator and the use of small motors would hurt the business. This may be true of some lines of work, but it is stated that more leather belting is being made at the present time than ever. The Bodifield company was never so busy. Manufacturers are buying freely and they are buying a better class of goods than a few years ago when they only seemed to want prices. Now they are buying quality. Prices in this line have not been satisfactory, and while there has been a recent advance the high price of leather makes large profits out of the question. In 1894 leather for belting reached the low figure of 23 cents per pound and now it is 43 cents, and manufactured belting is today in comparison with the price of leather cheaper than it ever was.

The Electric Controller & Supply Co., consulting and manufacturing electrical engineers, will move about the first of next year from present quarters and occupy part of the new buildings being erected by the Wellman-Seaver Engineering Co. The company intends to increase its output at least four times. In the new plant it will adopt electric individual tool drive wherever practical and expects to have a model shop.

The Excelsior Iron Works, manufacturers of coal and ore handling machinery, hoisting engines and structural iron work, have a large number of orders for swinging derricks, coal and ore buckets, conveying machinery, etc. Some of the departments are being rearranged so that the increased business may be handled to better advantage and the firm will probably put in a larger generator and several motors. The outlook for the coming year is very bright. After the first of January the firm will be reorganized under the name of the Excelsior Hoisting Machinery Co.

The National Acme Mfg. Co. has both the Cleveland and Hartford plants running to their full capacity with plenty of orders on hand. The new building in Cleveland is progressing favorably and will be occupied not later than Feb. 1, 1902, and at that time will transfer the Hartford plant to Cleveland. The company is contemplating an increase of the equipment in the machinery building as well as other departments.

The Standard Welding Co., located on Central Ave. and the C. & P. R. R., is at the present time giving its especial attention to the manufacture of seamless cylinders by electric welding, such as soda water tanks, range boiler cylinders, cream separator bowls, bottles for holding various kinds of liquids, fire extinguisher packages, etc. The job welding department is engaged in the manufacture of heavy iron rings for the construction of piers, welding metal wheels for baby carriages, go-carts, etc., also wire hoops for wooden packages. There is also great activity in the tube welding department, especially in the construction of Norway iron tubing for telephone construction work. A noteworthy product is automobile rims made in all types. The rims are made seamless by the welding process. In the bicycle department, the seat post business is in a flourishing condition. The specifications for general bicycle material are not being received as promptly as in years past, but this reflects the general conditions of the bicycle trade at large. The constantly decreasing use of the bicycle has tended to make all good manufacturers of this article conservative, and each year has seen the business gradually shrink from one carried on for nine to ten months in the year down to three or four months. The company is constantly increasing its equipment along more extended lines of manufacture, especially in connection with its welding work, as the demand is rapidly increasing for seamless cylinders, especially in the construction of automobile boilers, etc.

The Reliance Gauge Column Co. says that the business has never been better or more promising. Shipments of Reliance columns for the past year have been double the average output. They have also added in the past year or two "Reliance steam traps" and have placed this trap in a number of large rubber manufacturing plants where steam traps are given very severe tests. Orders are on file for both columns and traps for many months ahead. Recent changes in equipment include the addition of some new machinery and a general improvement in the facilities for getting out goods more promptly.

Some months ago the Burr Mfg. Co., manufacturer of hoisting apparatus, etc., underwent quite a change. Mr. Burr, the patentee, president and general manager, sold his interest to four of the stockholders. H. M. Strong was elected president, with F. W. Smith, secretary-treasurer and general manager. The company added new and improved machinery to its plant, and has been enabled to turn out its products much faster, and at the same time at a better figure to the jobbers. The exhibit at the Pan-American Exposition has been a great benefit, not only in the amount of the sales made directly, but by the meeting of thousands of the best mechanics in this country and Canada, and from all over the world. The company during the past week shipped a very good first

order to Copenhagen, Denmark. It is putting on the market a new device in the way of a "hold fast" for wire stretching, and expects soon to have all its steel lifts working on the ball-bearing principle.

The G. C. Kuhlman Car Co., builder of city and suburban electric cars, is about to move into its new factory at Collinwood, situated at the junction of L. S. & M. S. Ry. and Adams Ave. The new factory is one of the most modern and complete car building plants in the country, having a capacity of from 500 to 600 inter-urban cars a year. An order of 30 cars for the Aurora, Wheaton & Chicago Ry., will be the first turned out in the new plant. Orders are booked for 100 cars, with prospects of about 250 more.

The Forest City Foundry Co. will expend $1,800 on a brick addition to its foundry building on Main and Elm Sts.

## INDUSTRIAL SUMMARY.

**[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]**

**New Buyers in the Market and Some of their Wants:—**

The American Tube & Stamping Co., with a capitalization of $2,800,000, has absorbed the Wilmot & Hobbs Mfg. Co., of Bridgeport, Conn. Many of the stockholders in the old corporation are also stockholders in the new. The directors of the company are Frank A. Wilmot, A. N. Stanton, C. D. S. Miller, George L. Prentiss, E. G. Sanford, E. Langdon, and Henry W. Nutt.

The Solvay Process Co. last week purchased the plant of the American Steel Casting Co., at Syracuse, N. Y. The consideration is understood to have been $50,000.

A charter has been granted to the American Rolling Mill Corporation of Chicago, with a capitalization of $1,000,000. L. C. Straight, Henry Huffield and J. C. Pirie are the incorporators.

The Warwick Furnace Manufacturing Co., of Massillon, O., has been incorporated with $20,000 capital. W. H. Geiss, D. S. Sauers, H. W. Leoffler, J. N. Merwin and S. T. McMeeken are the incorporators.

The Franklin Galvanized Ware Co., of Indianapolis, Ind., has been incorporated with $3,500 capital. W. H. Unversaw, A. F. Curtis, D. A. Forsyth, C. E. Bowen, W. B. Jennings, P. W. Payne and F. E. Worrele are the incorporators.

The Kessler machine shop at Des Moines, Ia., has been sold to David Campbell of the same place for $8,500.

The Inland Tool Manufacturing Co., of Chicago, has been incorporated with $25,000 capital. The new company will manufacture tools and machinery. Herman Heinebach, T. A. Stupe and William A. Rawson are the incorporators.

**Fires and Accidents:—**

Fire at the Phœnix Foundry Co.'s plant at Detroit, Nov. 27, caused a loss of $25,000, the foundry being totally destroyed.

The foundry and machine shop of J. M. Montigel, at Alma, Mich., burned last week with $12,000 loss. It will be rebuilt.

The large plant of the National Enameling & Stamping Co., at Williamsburg, N. Y., was destroyed by fire last week with a loss of $500,000.

The plant of the Enterprise Foundry at Kansas City, Mo., was damaged to the extent of $1,000 by fire last week.

The entire plant of the Crawfordsville Wire & Nail Co., Crawfordsville, Ind., was destroyed by fire last week. The loss is nearly $200,000. The plant was only recently completed and has been in operation about a month. The amount of insurance carried was small in comparison with the loss.

**New Construction:—**

At a meeting of the board of directors of the Bethlehem Steel Co., held at Philadelphia last week an expenditure of $500,000 was authorized to increase the armor-making capacity of the plant. The output will be increased from 4,500 to 6,000 tons per annum.

The Murphy Iron Works, Detroit, Mich., have commenced the erection of an extension 110x76 feet.

The Michigan Yacht & Power Co., Detroit, Mich., will build a machine shop.

The LaBelle Iron Works, Steubenville, O., will erect a new blast furnace. It will be erected near the old stack, which will be dismantled. The new stack will be 90 feet high with 20-foot bosh. It will be equipped with four Massicks and Crookes hot blast stoves to be built by George W. McClure, Son & Co., of Pittsburg. They will be 20x85 feet. The Girard Boiler & Mfg. Co., Girard, O., has been awarded the contract for the iron work on the stoves, while the iron work for the stack has not yet been placed.

The Illinois Wire Co., Des Plaines, Ill., will build an addition 53x200 feet.

The Knoxville Iron Co., Knoxville, Tenn., will break ground for its new works at Lonsdale, a suburb of Knoxville, shortly before the first of the year. The plant will consist of a forge shop 80x376 feet; furnace house, 68x220 feet; rolling mill, 75x220 feet; warehouse, 180x250 feet; machine shop, 50x100 feet; gas producer house, 40x80 feet. In addition there will be a blacksmith shop, crusher house and office building. The capacity of the plant will be about 50,000 tons per annum.

C. H. Besly & Co., Chicago, will erect an addition to their Beloit, Wis., plant which will afford 2,500 additional square feet of space. The plant at present is overcrowded.

Timmes & Hecht, successors to Peter Timmes' Son, who for some years operated a plant at Brooklyn, N. Y., recently completed their new rolling mill and spike factory at Scranton, Pa. The spike factory was placed in operation this week. A plant for galvanizing a part of the firm's own product is now under construction.

Blast furnace No. 5 of the Cambria Steel Co., Johnstown, Pa., is being rebuilt, and will be equipped with a modern top.

The Ohio Falls Iron Co., New Albany, Ind., which recently purchased the old rail mill at New Albany, will install a puddle mill, bar mill and a mill to roll light rails. We are officially advised that there will be no sheet mill. An office building and electric lighting plant will also be built. The company is in the market for machinery both for the electric lighting plant and for the mill.

At a meeting of the directors of the Youngstown Iron Sheet & Tube Co., held last week the management was authorized to proceed with the erection of an open-hearth plant. Plans will be prepared immediately and efforts will be made to have the plant completed within a year. The size of the plant has not yet been decided upon. The capital stock at present is $2,000,000, but it is probable that this will be increased.

**The Pittsburg District:—**

Last week 15 minor bosses employed at the Edgar Thomson mills and furnaces received blocks of stock in the Carnegie Company, ranging from $1,000 to $10,000. Those remembered are as follows: Furnaces—Thomas Price, machine shop foreman; Thomas Carothers, assistant transportation and labor department superintendent; Thomas Cosgrove, Nicholas Knaresborough, foreman of yard tracks, and Alex. Durant, foreman of blast engines. Edgar Thomson rail mill workers: Albert Aiken, boss painter; William Benson and Hiram Hutzen, master rollers of rolling mills on the two shifts for 20 years; Robert J. Kinter, boss blacksmith, and James Rinard and Perry Mackey.

The Duff Patents Co., Empire Building, Pittsburg, will shortly ship 32 gas producers of the Duff type to the Colorado Fuel & Iron Co., Denver, Col. This is one of the largest single orders yet placed.

George W. McClure, Son & Co., Smith Building, Pittsburg, has been awarded the contract for raising the four hot blast stoves of the furnace of the Brier Hill Iron & Coal Co., Youngstown, O., from 65 to 85 feet.

The Pennsylvania Casting & Machine Co., Allegheny, Pa., will erect an addition to its foundry to cost $1,500.

Furnace D of the Edgar Thomson group of the Carnegie Steel Co. is out of blast and is being relined and entirely rebuilt.

The Hecla Coke Co., of Pittsburg, Pa., will greatly extend its operations in the Connellsville region. A new coal tipple will be erected and 300 coke ovens are to be built immediately.

**General Industrial Notes:—**

At the request of the Buffalo, N. Y., stockholders of the Lackawanna Iron & Steel Co., which is erecting a new plant

at Stony Point, near Buffalo, N. Y., the stock of the company has been placed in the hands of three trustees, to be held by them until the plant is completed and placed in operation. It was feared that a controlling interest in the plant would be secured by outside parties in favor of the United States Steel Corporation and that then the plant might never be completed. As soon as the plant is placed in operation the trustees will be discharged.

A settlement on the basis of 25 cents on a dollar has been effected with the creditors of the Malleable Iron Works of Lancaster, N. Y., and the plant will be continued in operation either by the present company or a new organization. In November, 1900, the creditors of the company appointed a committee of five to operate the plant and up to date it has been operated at a profit. The following stockholders intend forming a company to operate the plant: H. H. Hewitt, W. D. McKeefry, F. R. Green, H. C. Rich, John Remers, J. O. Garretsee, C. D. Rood, Hon. J. S. Lambert, C E. Rood and E. C. Randall.

The Miller Gas Engine Co., Springfield, O., has received an order for eight 150 h. p. engines from the Manufacturers' Natural Gas Co., of Indianapolis, Ind.

The new foundry of the Superior Drill Co., Springfield, O., will be placed in operation shortly.

The plant of the Mansfield Machine Works, Mansfield, O., has been purchased by the Aultman & Taylor Machinery Co., of the same place, for $65,000. The plant was appraised at $68,000 by the court, having recently gone into the hands of a receiver.

On the New York stock exchange last week common and first preferred Westinghouse Electric & Manufacturing Co. stocks were sold at the highest prices yet recorded. The common sold at 145, while the first preferred 100 shares sold at 157. This was the first transaction in several years for both stocks.

The furnace of the Columbus Steel & Iron Co., Columbus, O., was compelled to bank last week owing to inability to secure coke.

At a meeting of the creditors of the Continental Iron Co., held at Warren, O., last week, W. D. McKeefrey was elected trustee to succeed R. S. Henderson. The creditors authorized the trustee to expend $30,000 in improvements and additions to the mill. Efforts will be made to place the mill in operation immediately, as much business is already assured the company. Ephraim Truxall, of Pittsburg, Pa., who was connected with the Sligo mill for many years, has been appointed manager.

On Nov. 21 on a ten-hour shift, the Phoenix Iron Works, Phoenixville, Pa., rolled 120 3-10 tons of finished 12¼ pound beams. The tonnage was rolled on a 24-inch train driven by a pair of 28x48-inch reversing engines, built by Mackintosh, Hemphill & Co.

A petition for the appointment of a receiver for the plant of the Schwartz Foundry Co., Ltd., New Orleans, La., was applied for last week. Stock of the company is held as collateral by the suspended American National Bank and the receivership is for the purpose of protecting this collateral. It is alleged that the total indebtedness of the company is $232,498.92.

At the annual meeting of the West End Rolling Mill Co., of Lebanon, Pa., last week, J. Henry Miller resigned the presidency, which he held for many years, and C. Shenk was elected his successor. J. R. Evans was elected secretary and H. M. Capp, treasurer and general manager. A 3 per cent semi-annual dividend was declared. It was decided to erect a new office building and to add three furnaces to the rolling mill and chain department. A contract for two additional boilers was awarded the Lebanon Boiler Works.

Providing a suitable location can be secured, the plant of the Danielson Machine Tool Co., of Cleveland, O., will be removed to Canton, O. It is probable that a bonus will be offered for the removal of the plant.

The capital stock of the McKenna Steel Working Co., of Milwaukee, Wis., has been reduced from $10,000,000 to $1,000, owing to the recent sale of the patents of the company to the American McKenna Process Co., and to close up the affairs of the company.

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A typographical error gave the Morrison Steam Shovel Co. the contract for a 75-ton steam shovel for the Ohio Iron & Steel Co., Lowellville, O., as mentioned in our last issue, instead of the well-known Marion Steam Shovel Co.

## GOOD WEEK'S RUN ON AN OPEN-HEARTH FURNACE.

The following record of one week's run on a basic steel melting furnace at the plant of the Hamilton Steel & Iron Co., Hamilton, Ont., is of interest, on account of the excellent time made in the run, which is believed to be the best ever accomplished in this size furnace. The plant consists of two 15-ton Wellman rolling open-hearth furnaces, in a building provided with electric traveling cranes, charging machines and other equipment for the rapid and economical handling of stock. Gas for the furnaces is provided by a battery of Talbot gas producers and the whole plant represents modern practice in open-hearth work. It has been in operation for a little more than a year, and was designed by the Wellman-Seaver Engineering Co., of Cleveland, O. The good work done on these furnaces has been under the direction of F. B. McKune, superintendent. The quickest heat shown on the record, namely, 4 hours and 50 minutes from tap to tap, has never been equaled:

| Date. | Tapped. | Started to Charge. | Tapped | Time from Tap to Tap. | | Time from Charge to Tap. | |
|---|---|---|---|---|---|---|---|
| | | | | Hrs. | Mins | Hrs | Mins |
| 1901 | | | | | | | |
| Nov. 3 | ..... ... .. | 11:00 a. m. | 5:50 p. m. | | ... | 6 | 50 |
| " 3... | 5:50 p. m. | 6:15 p. m. | 11:30 p. m. | 5 | 40 | 5 | 15 |
| " 4... | 11:30 p. m. | 11:45 p. m. | 5:15 a. m. | 5 | 45 | 5 | 30 |
| " 4... | 5:15 a. m | 5:30 a. m. | 11:15 a. m. | 6 | ... | 5 | 45 |
| " 4... | 11:15 a. m. | 11:25 a. m. | 5:15 p. m. | 6 | ... | 5 | 50 |
| " 4... | 5:15 p. m | 6:00 p. m. | 11:15 p. m. | 6 | ... | 5 | 15 |
| | (45 min. delay on steam.) | | | | | | |
| " 5... | 11:15 p. m. | 11:45 p. m. | 4:50 a. m. | 5 | 35 | 5 | 5 |
| | (30 min. delay for stock, waiting on engine.) | | | | | | |
| " 5... | 4:50 a. m. | 5:05 a. m. | 11:00 a. m. | 6 | 10 | 5 | 55 |
| " 5... | 11:00 a. m | 11:30 a. m. | 4:30 p. m. | 5 | 30 | 5 | ... |
| | (20 min. delay washing out.) | | | | | | |
| " 5... | 4:30 p. m. | 5:20 p. m. | 11:00 p. m. | 6 | 30 | 5 | 40 |
| " 6... | 11:00 p. m. | 11:20 p. m. | 3:55 a. m. | 4 | 55 | 4 | 35 |
| " 6... | 3:55 a. m. | 4:20 a. m. | 10:10 a. m. | 6 | 15 | 5 | 50 |
| " 6 | 10:10 a. m. | 10:20 a. m. | 3:00 p. m. | 4 | 50 | 4 | 40 |
| " 6... | 3:00 p. m. | 3:35 p. m. | 9:35 p. m. | 6 | 35 | 6 | ... |
| | (35 min. delay waiting on engine for stock.) | | | | | | |
| " 7... | 9:35 p m | 10:45 p. m. | 5:40 a. m. | 8 | 5 | 5 | 55 |
| | (2 hr. and 10 min. delay making back wall and changing port ends.) | | | | | | |
| " 7... | 5:40 a. m. | 5:50 a. m. | 11:20 a. m. | 5 | 40 | 5 | 30 |
| " 7... | 11:20 a. m. | 11:40 a. m. | 5:25 p. m. | 6 | 5 | 5 | 45 |
| | (20 min. delay washing out.) | | | | | | |
| " 7... | 5:25 p. m. | 5:40 p. m. | 11:50 p. m. | 6 | 25 | 6 | 10 |
| " 8... | 11:50 p. m | 12:15 a. m. | 6:25 a. m. | 6 | 30 | 6 | 10 |
| " 8... | 6:25 a. m. | 6:40 a. m. | 12:30 p. m. | 6 | 5 | 5 | 50 |
| " 8... | 12:30 p. m | 12:45 p. m. | 6:35 p. m. | 6 | 5 | 5 | 50 |
| " 9... | 6:35 p. m. | 7:10 p m. | 1:05 a. m. | 6 | 30 | 5 | 55 |
| " 9... | 1:05 a. m. | 1:20 a. m. | 6:55 a. m. | 5 | 50 | 5 | 35 |
| " 9... | 6:55 a. m. | 7:10 a. m. | 1:00 p. m. | 6 | 5 | 5 | 50 |
| | (15 min. delay washing out.) | | | | | | |
| " 9... | 1:00 p. m. | 1:20 p. m. | 7:30 p. m. | 6 | 30 | 6 | 10 |
| " 10... | 7:30 p. m | 8:15 p. m. | 1:45 a. m. | 6 | 15 | 5 | 30 |
| | (45 min. delay on charging.) | | | | | | |
| " 10... | 1:45 a. m | 1:55 a. m. | 6:50 a. m. | 5 | 5 | 4 | 55 |

The best time on a heat from charge to tap was 4 hours, 35 minutes. The charge consisted of 51 per cent of basic pig iron; the balance was miscellaneous scrap. The average charge was 30,000 pounds to the heat. Nothing but 6-inch ingots was made during the week, with the exception of about 10 tons of steel castings. Producer gas was used for fuel.

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We are officially advised that the National Tube Co. is not contemplating the erection of an additional furnace at its McKeesport plant nor is it contemplating great improvements as reported. The new furnace of the company at Wheeling, W. Va., will be completed in the spring or early next summer. It will have a capacity of about 600 tons per day.

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The Youngstown Steel Casting Co., with a capital of $50,000 was organized at Youngstown, O., last week. The abandoned plant of the Forsythe scale works has been purchased and the plant will be equipped with foundry machinery shortly. This company supplants the proposed Walker Engineering Co. E. B. Lawrence, Arthur Eynon, David Rosser, H. Parrock, J. R. Long, G. E. Rose, J. W. Rogers, George Higley, T. B. VanAlstine and H. Harris compose the board of directors. E. P. Lawrence is president, T. B. VanAlstine vice-president, and J. W. Rogers secretary and treasurer. In addition to the present building two new ones will be built, 50x200 feet and 70x130 feet, respectively.

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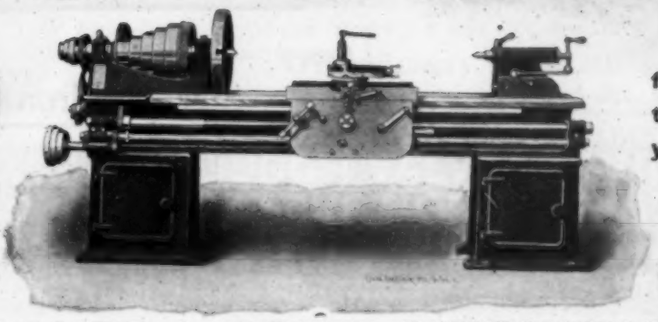

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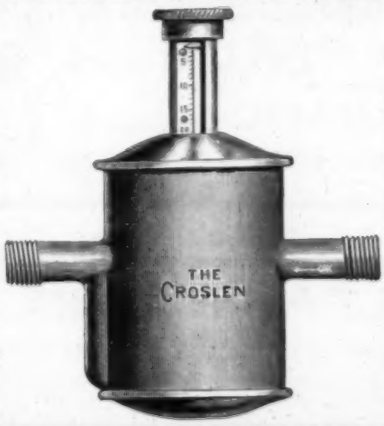


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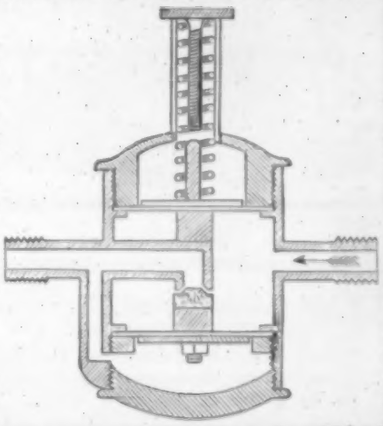

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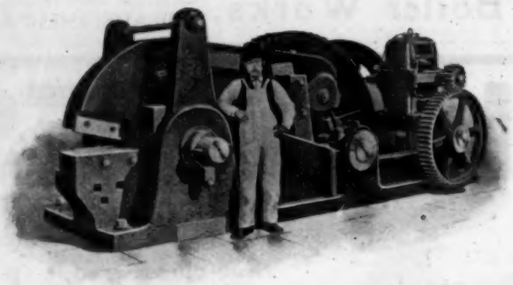

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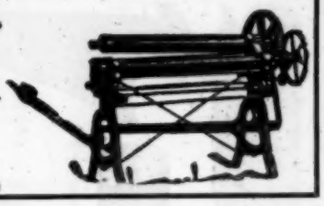

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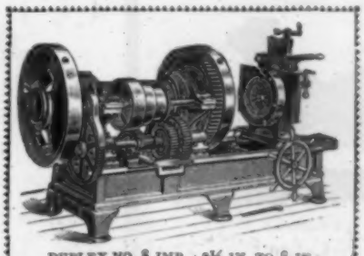

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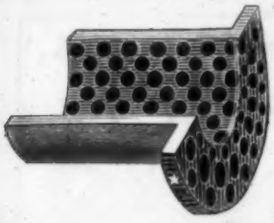

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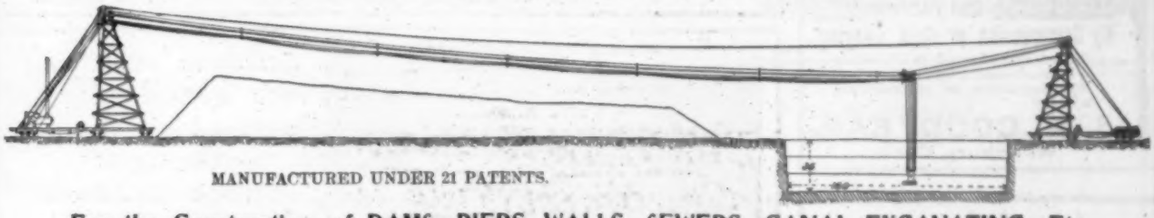

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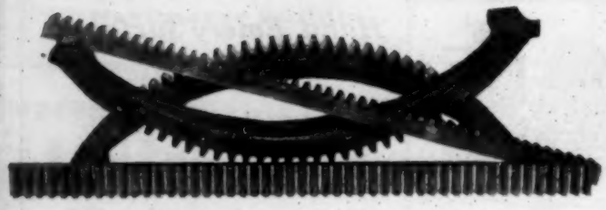

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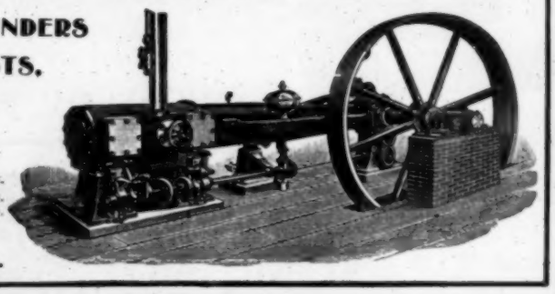

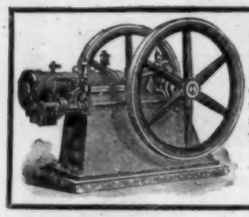

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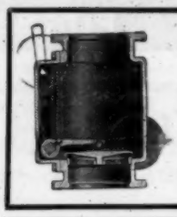

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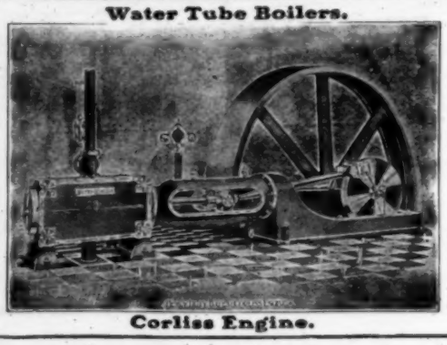

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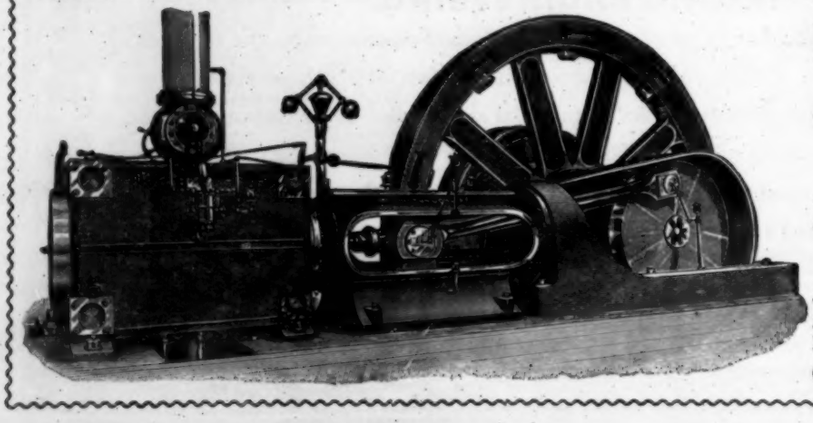

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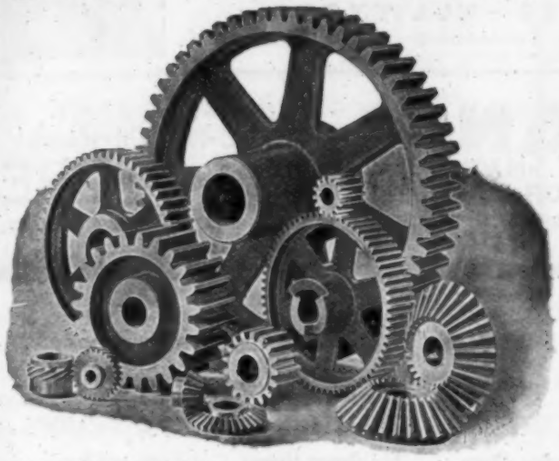

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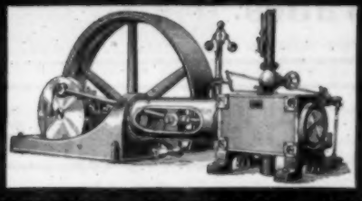

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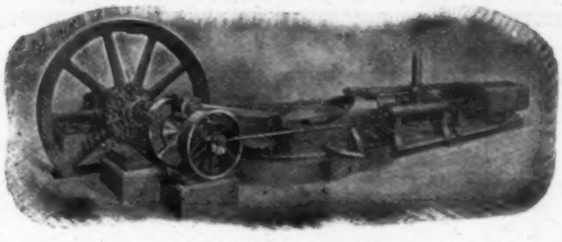

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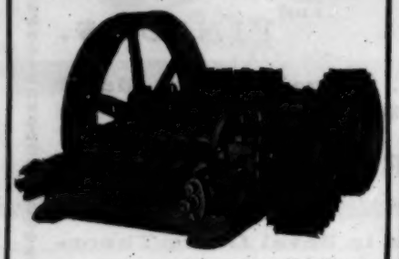

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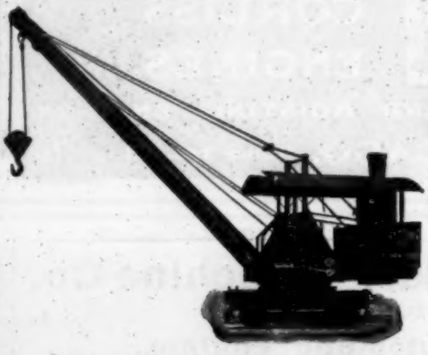

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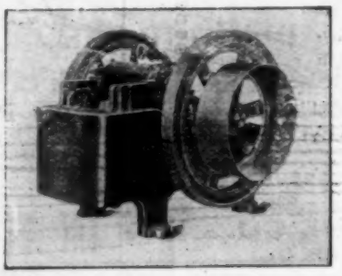

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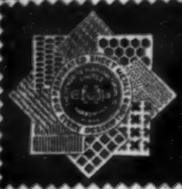

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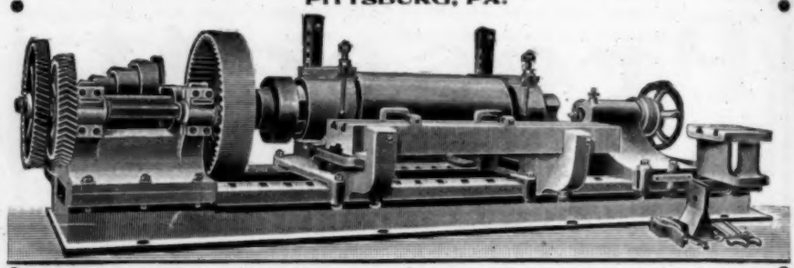

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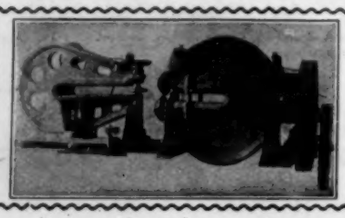

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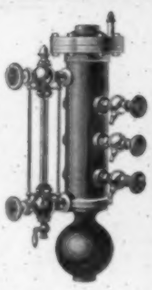

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